

University of Alberta

Metacognition in the Library Research Process:

A Study of Grade Five Students

by

Andrea Roche



A thesis submitted to the Faculty of Graduate Studies and Research in partial
fulfillment of the requirements for the degree of Master of Education

Department of Elementary Education

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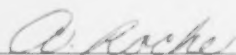
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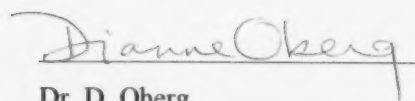
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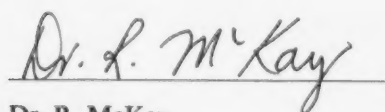
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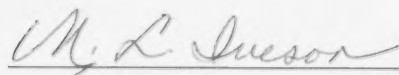
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ABSTRACT

Researchers have identified a relationship between success in carrying out library research activities and the use of metacognitive strategies. This study explored the nature and extent of the use of metacognitive processes by twenty-nine grade five students engaged in a library research project. A teaching team of researcher, teacher, and teacher-librarian cooperatively planned and taught a Space unit that required students to write a science fiction story, incorporating factual information from their library research. The unit plan included metacognitive strategies such as planning, goal setting, self-reflection, monitoring progress, and self-evaluation. A Research Framework, begun before the study and extended through data analysis, was used to determine the metacognitive aspects of awareness, planning, reflection and self-evaluation, and self-regulation. Data analysis showed that the students engaged in all of these metacognitive aspects. The metacognitive aspects were interrelated and there was a dynamic interplay between them. The evidence from this study showed that metacognitive processes are complex and that students differ in how they engage in the processes. Monitoring their own mental processes seemed to allow students the opportunity to know themselves and the ways in which they learn, to achieve their goals, and to create successful learning experiences for themselves.

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CHAPTER ONE

Introduction

How will today's students fare in an information and technology rich environment? As educators, we have an obligation to acquaint students with strategies and skills so that in a sea of information, they will not sink, but swim competently and confidently.

For decades educators held that the key to academic success was in teachers' transmission of information and students' retention of this same information. More recent pedagogy places greater importance on developing students' ability to retrieve information and on encouraging students' learning processes. The school library provides resources and information for those with an information need and the ability to access information. However, basic information retrieval is only a small part of the library research process.

Much of current practice in teaching the library research process is based on the research of Carol Kuhlthau, a researcher from Rutgers University. Kuhlthau's work began with a study of senior high school students. She identified six stages of the library research process and also described the corresponding feelings experienced by the students in each stage as they carried out their research assignments. Kuhlthau has contended that it is important for students to understand the research process in order to intelligently use library resources and to be able to transfer their skills to other information needs in other libraries.

In addition to understanding the research process, students also need to be cognizant of their own mental processes in order to be successful in research assignments. Kuhlthau stated:

Opportunities need to be provided for students to become aware of the research process, reflect on their own effort and assess ways their process might be improved in future library use. In this way, a metacognitive perspective is applied to the process of locating and using information. (1987, p. 27)

When I reflect on my own library research experience when I was an elementary school student, my feeling is that there was little opportunity for library research and that I was not properly equipped or guided in this process. The library was only used once a week to get a free reading book, not for research purposes. I remember writing a bee report in grade five, using one book from home that had a good article about bees. Although I do not remember for sure, I probably copied a few sentences directly from the book. I do not recall being aware of the research process or of my own mental processes as I worked on this report. I suspect that my experience was probably quite typical of most elementary school children at that time.

A more memorable research project was one that I carried out in grade ten for my biology class. The assignment was dubbed "The Pond Project." We were given a small aquarium filled with pond water to study. We looked at water samples under a microscope, observed the many interesting creatures and plant life living in this environment, identified the creatures, took daily percentage counts of our population, and noted observations and changes in the population. The project culminated with a written report where we included graphs, tables, a write-up about what we had done and observed as well as a discussion about the connections that we made. It was a most interesting and motivating project. The procedures for this project were very process oriented and the research we carried out was meaningful--I remember looking anxiously through books to try to identify some of the life in my pond. Although I have memories of enjoying this assignment, I do not recall being cognizant of my own mental processes as I carried out the research for this pond project.

I have also reflected on my own teaching practice over the years and have remembered with feelings of surprise and guilt the expectations that I imposed on students during research assignments. Is library research different for children today?

As part of a course during my master's program, I conducted a pilot project to explore the library research experiences of a few children. I interviewed five boys from our neighborhood and asked them about their library research experiences. Reviewing our conversations, I realized that four of the five boys referred to written reports that they had completed. Because there are so many exciting and creative

ways to share students' research, I was surprised that the traditional written research report seemed to remain very popular among teachers. I was also aware that the boys seemed to focus more on final products during our conversations than on the processes they engaged in to complete the final products. One fellow who seemed particularly disinterested in research told me that he had worked on a country report using an almanac. This did not sound to me like a very motivating assignment. The youngest boy enthusiastically shared his learning experiences while researching about apples in a classroom unit. From what he shared with me, the approach to his research about apples seemed to be more process-oriented.

Theorists have differing views about how and when metacognitive processes develop in children. Studies show, however, that even high school students are not always aware of their own thinking as they engage in library research (see, for example, McGregor, 1994). Little research has been carried out in relation to how upper elementary children experience the library research process. Can upper elementary students be taught metacognitive strategies to facilitate awareness of and control over their own mental processes?

The purpose of this study was to explore the extent to which grade five students use metacognitive strategies and processes while they are engaged in a library research project. The following questions have guided the study:

- What thoughts do children appear to have as they engage in the research process?
- Do students seem to be aware of their own mental processes as they engage in library research?
- Does being cognizant of their own mental processes influence students' research behavior?
- To what extent do students use metacognitive strategies when those strategies are taught as part of a library research unit?
- Is there a relationship between the use of metacognitive strategies and the successful completion of library research endeavors?

It is with these questions that I express concern and caring for students involved in the library research process. The findings of this study should contribute to the growing

body of research related to how learners experience the library research process.

There may be implications for teachers and teacher-librarians who engage in library research projects with children.

CHAPTER TWO

Literature Review

To be conscious that we are perceiving or thinking is to be conscious of our own existence.

Aristotle, 384-322 BC
Nicomachean Ethics, bk. 1, ch. 1

Metacognition

Metacognition is a phenomenon that has been explored by many educators. A survey of the literature shows that, although the definitions are many and varied, they share some basic, common themes.

Flavell (1979), a pioneer of research on metacognition, defined metacognition as the monitoring of cognitive progress. His work distinguished between cognitive strategies that are invoked to make cognitive progress and metacognitive strategies that are invoked to monitor cognitive progress. Flavell's model indicated that this monitoring was a dynamic interplay between metacognitive knowledge, metacognitive experiences, goals, and actions.

According to Flavell (1979), metacognitive knowledge is the knowledge one has about the factors that interact in a cognitive process and knowledge one has about how to affect the outcome of cognitive enterprises. Flavell stated that metacognitive knowledge consists of three categories: person, task, and strategy. The person category refers to the knowledge an individual has about how one learns. Flavell used the example of a person knowing that one learns better by listening than by reading. The task category refers to information that is available to a person about how a task should be managed and the possibilities of success in achieving goals in a given situation. Strategy is the knowledge acquired concerning the strategies that will be most effective in achieving the desired goals.

Metacognitive experiences take place when metacognitive knowledge enters one's consciousness (Flavell, 1979). They occur in situations where there is highly conscious thinking. A sudden awareness by a reader that a passage just read has not been understood is an example of metacognitive experience (Rennick, 1995). These occurrences may compel an individual to form new goals or to revise or abandon old ones (Flavell, 1979).

Brown and DeLoache (1978) have defined metacognition as the voluntary control an individual has over his or her own cognitive processes. Young children may not engage in metacognitive behavior because they are "universal novices" (p. 14) and novices at anything may not think about their own mental processes. Also, young children often do not realize that certain metacognitive skills transfer to other situations. Brown and DeLoache have contended that many of the behavioral changes that take place during child development are influenced by the growth of metacognitive abilities. Brown and DeLoache have identified a number of metacognitive skills that they believe are transsituational, that apply to a whole range of problem-solving activities. These skills include: predicting the consequences of an action, checking the results of one's own actions, monitoring one's ongoing activity, reality testing (does something make sense?) and coordinating and controlling deliberate attempts to learn and solve problems.

Metacognitive processes involve conscious monitoring and regulation of mental processes (Bondy, 1984). Bertland (1986) similarly viewed metacognition as the mental activities involved in thinking about and regulating one's own thoughts. "Metacognition encompasses all thinking that we do to evaluate our own mental processes and to plan for the appropriate use of these processes to meet the demands of a situation" (p. 96).

Babbs and Moe (1983) have considered metacognition during the reading process and see it displayed in students who strategically regulate while reading. "Metacognition refers to the ability to monitor one's own cognition; it is thinking about thinking" (p. 425). Abromitis (1994) also related metacognition to reading comprehension and concluded that most researchers agree that the knowledge of

thought processes and the purposeful use of strategies are two inherent components of metacognition.

Metacognition is being aware of our thinking as we perform specific tasks and then using this awareness to regulate what we are doing (Marzano et al., 1988). Marzano et al. have contended that knowledge and control of self and knowledge and control of process are two primary aspects of metacognition. In order to exert metacognitive control over mental processes, an individual must know what facts and concepts are necessary for a task, which strategies are appropriate to the task, and how to apply the selected strategy to the task. Control over an individual's behavior involves evaluation, planning and regulation. Evaluation occurs throughout the process and involves assessing one's current knowledge, assessing whether one has the necessary resources required for the task, and assessing task goals. Planning involves deliberately selecting strategies to fulfill specific goals. Regulation is checking one's progress towards the goals identified. These skills serve to govern one's actions during mental processes.

Metacognition is the ability to scrutinize one's own thinking (Harrison, 1991). Fogarty and Ballanca (1993) have stated that metacognitive processing allows a learner to step outside a situation and examine the thinking process itself. This view implies a kind of objectivity on the part of the individual, monitoring and regulating in order to achieve the best results, according to the mind of the learner. It includes planning, monitoring, evaluating, thinking, adjusting along the way, and assessing the final outcome.

Li (1993) believed that the heart of metacognition is the dynamic thinking process--critical and conscious action. "The dynamic reflective thinking process exerts influence beyond controlling and directing one's learning strategies. It is a key to one's inner 'whole,' a compass on the sea" (p. 5). Li has viewed metacognition as a developmental process that is different for everyone. Critical thinking and creativity cannot be isolated from metacognition. She has emphasized that making changes in one's thinking and, ultimately, in the action taken is essentially empowerment through metacognition. Li saw metacognition as a means to liberate one's potential, making it

possible for educators to encourage independent and life-long learning in their students.

The literature has revealed that there are indeed common threads through the views of psychologists and educators about metacognition. Most people seem to agree that there is an awareness, a knowledge of cognitive processes as well as self-monitoring and regulation of these processes. Monitoring and regulating mental processes leads to the purposeful use of strategies.

Metacognition and Two Theories on Thinking and Development

Theorists have referred to metacognition in their discussions about thinking and development. Jean Piaget, a French psychologist, and Lev Vygotsky, a Russian psychologist, have differing views of how awareness and self-regulation occur as children progress. Perspectives from these two theorists offer much for the researcher in terms of understanding children's cognitive development and the ways that this development may be enhanced.

Piaget (1972/1973) has identified four main stages of development as a child matures. The infant begins in the sensorimotor stage where there is a dependency on the immediate stimulus to control the child's actions. This dependence is gradually replaced by an internal organization through which behavior is affected by the stimulus (Halford, 1982).

The second stage, preoperational, occurs between two and seven years of age. This stage is characterized by the development of symbolic processes: imitation, play, drawing, imagery, memory, and language (Piaget, 1972/1973).

Concrete operational, from age seven to eleven, is the third stage that is characterized by the acquisition of concepts such as conservation, transitivity, seriation, and classification. It is during this stage that thought reflects experience; it is symbolic and new symbols may be generated.

The formal operational stage occurs at the age of eleven or twelve. At this stage the child exhibits a higher level of compositions and has more power to create

new symbols; the thought structures are more elaborate. Experience is a reflection of thought at this stage. The child is capable of systematically considering alternative combinations (Halford, 1982). This, then, according to Piaget, is the stage where metacognitive processes exist. The child is able to regulate his or her own thinking.

Concepts from previous stages are integrated into subsequent stages. Piaget (1972/1973) has pointed out that there is a problem with generalizing when considering these stages; these stages depend on an individual's previous experience and not only on maturation. He has stated that social milieu can hasten, delay, or prevent the manifestation of a stage.

Vygotsky was partly inspired by Marxist thinking: Marx thought that the ability to plan and direct one's activity was peculiar to humans (Braten, 1991). Vygotsky contended that at all stages of development children acquire the means to control and direct their own behavior. He described the change that occurs in the structure of psychological processes as a transition from non-mediated to mediated activity. Higher psychological processes come into play when simple, direct responses are replaced with a complex, mediated act as required by the task. The impulse to react in a simple fashion becomes inhibited and higher mental processes take over. This requires the individual to become actively engaged in his or her mental processes (Braten, 1991). Vygotsky has suggested that higher psychological processes are formed and maintained through mediation by language. In other words, the language of the environment stimulates thought.

Braten (1991) has discussed the differing views of Piaget and Vygotsky. Piaget addressed the notion of egocentric speech used aloud by a preschooler to himself or herself in the presence of others. Piaget considered egocentric speech to be a useless accompaniment to a child's activity. However, Vygotsky had observed that the amount of egocentric speech used by children while problem solving increased with the difficulty of the problem. Vygotsky viewed this speech as being self regulatory and therefore usefully connected to a child's thinking. He maintained that it provided a conscious understanding and helped the child to overcome difficulties. It

became apparent to Vygotsky that egocentric speech was a manifestation of the process of awareness in a child.

Braten (1991) has observed that a Vygotskian perspective of verbal thought emphasizes language "as a means of controlling and/or regulating one's own cognition" (p. 311). When socialized speech is turned inward, language "takes on an intrapersonal function in addition to its interpersonal use" (Vygotsky, 1978, p. 27). According to Vygotsky, egocentric speech in the preschooler later becomes inner speech in school children.

Vygotsky's work placed importance on social interaction. He has proposed that a child has two developmental levels. The actual developmental level is the level of mental functions that are established. The distance between the actual level and the potential level of development as achieved by problem solving with guidance or collaboration is called the zone of proximal development. Every child has buds of potential for learning that require the scaffolding provided by social interaction in order for learning to be internalized. In other words, what a child does with assistance today, he or she will be able to do alone tomorrow.

Vygotsky believed that prior to the stage of internal mediation, a child required understanding of external mediation. He felt that school instruction was instrumental in making a child conscious of his or her own mental processes. In Vygotsky's opinion, awareness and deliberate control of a cognitive process appear only after this has been practised unconsciously and spontaneously for a long time (Braten, 1991). Clearly, Vygotsky's developmental theory has suggested that language and social interactions are paramount to a child's learning and instrumental in awareness and regulation of cognitive processes.

Both Piaget and Vygotsky have pointed out that aspects of cognitive development are influenced by social interaction. Piaget's stages of development have influenced my teaching practice. However, as I progressed with my graduate work, I found myself drawing more heavily on a Vygotskian perspective of children's cognitive development.

Metacognition and the Library Research Process

Metacognition has been explored in the context of school libraries and more specifically, with consideration to the library research process. Many educators have identified a relationship between success in carrying out research activities and engagement in metacognitive strategies.

Berland (1986) has noted that research in reading comprehension suggests that more attention needs to be paid to the level at which children process information they acquire from the library. Programs for information skills instruction must take into account the cognitive development of students. Bertland has noted the similarities between evaluation, planning, and regulation and the steps in the information search process: question analysis, selection of appropriate search tactics, and evaluation of the results of each step taken throughout the search process. Bertland has contended that students need to be instructed in thinking skills critical to planning and evaluating information they receive.

Handy (1993) has suggested that the research process requires students to apply higher-order thinking skills and that it provides an opportunity to teach these skills. Hughes (1986) has viewed the teacher-librarian as being in an ideal situation to gain and share the awareness of developmental sequences in the growth of thinking skills in students. She believed that student interaction with information sources was mediated by teacher questions. The lesson structure and types of questions asked by teachers can greatly influence the kinds of thinking in which students engage.

McGregor (1994) carried out a study with high school students that was designed to describe and analyze higher-order thinking skills used by students engaged in research. Results of this study revealed that students' thinking was intuitive; students did not automatically use metacognitive processes. McGregor identified two ways that students' thinking related to information: external purposes and internal purposes. External purposes refers to skills that are applied to the research process and used to carry it out; for example, analyzing and evaluating information for its usefulness or evaluating whether or not a product was successful in achieving a goal.

Internal purposes include those that deal with the information itself: assessing the validity of statements in information, and analyzing facts or ideas in order to support a particular viewpoint. McGregor discovered that students' thinking progressed naturally through the levels of thinking described in Bloom's taxonomy. Also, the level of thinking that was used depended on the kind of question to be answered. Lastly, students were very product oriented in their thinking; they were less aware of the processes involved in making sense of information. McGregor developed a model of thinking during information use, based on this study.

McGregor (1994) concluded that having students reflect on their own thinking can help them to identify where their thinking requires improvement and to deal with any barriers that exist. She noted that one-to-one interaction between educators and their students provided students an opportunity to explore their own mental models and identify the gaps (McGregor, 1995). In this way, students become more attuned to their mental processes and are able to regulate processes and their research behavior in order to achieve their goals. McGregor believed, "If this mental monitoring begins early in their educational careers, habits of productive thinking and learning may well be developed throughout the years they spend in school" (1995, p. 7).

Three basic metacognitive strategies have been identified by Blakey and Spence (1990): connecting new information to former knowledge; deliberately selecting thinking strategies; and planning, monitoring, and evaluating thinking processes. They stated that studies have shown that direct instruction in metacognitive strategies resulted in an increase in learning. Blakey and Spence have maintained that metacognitive behavior occurs when situations arise that cannot be solved by learned responses. Metacognitive strategies, such as having students keep thinking journals and talking about their thinking with others, help children to reflect and to become more aware of their own thinking.

Based on her study of junior high students and their experience with the library research process, Loerke (1992) has also advocated the use of strategies such as the use of journals and student discussions to teach metacognitive behavior.

This concern for students' learning experiences and for enhancing students' learning in the library media center was also expressed by Pitts (1992). A suggestion made by Pitts was that there is a need to provide additional materials in order for students to be put in a position where they must examine their own ideas. This enables students to alter or reject their first ideas and expand their understandings. According to Pitts (1992), interaction with others is a way of encouraging students to think critically and to clarify their understandings as they communicate. Involving students in thinking critically is imperative; thinking about their ideas and organizing information in new ways are essential skills. Ample time for personal reflection needs to be allowed during research assignments. All of these suggestions expressed by Pitts affirm that metacognition is an integral part of the research process.

Summary of Perspectives on Metacognition

The literature about metacognition has suggested that it is a complex phenomenon and there is no one, simple definition for metacognition. However, there are common threads through the differing views including an awareness and knowledge of self and thought processes and the use of this awareness to regulate what one does, through knowledge and control of process.

Theorists' views also differ about metacognition. Piaget (1972/1973) stated that metacognitive processes occur at the formal operational stage of development at eleven or twelve years of age. Vygotsky (1978) contended that children acquire the means to control and direct their own behavior at all stages of development and that language and social interactions are key factors in developing the awareness and regulation of cognitive processes.

Flavell's (1979) model of metacognition was a popular concept among educators in the eighties. Much research and speculation concerning metacognition developed in the field of reading. This led to further study of metacognition and its value in other educational areas. Metacognition has been considered to be instrumental in students' success during the library research process. Direct

instruction in metacognitive strategies and having students monitor their mental processes have been viewed as means to productive, critical thinking and learning. The literature has espoused the importance of metacognition and this has implications for teachers.

CHAPTER THREE

Methodology

Introduction

A qualitative inquiry is most suited to this study. A qualitative inquiry is evolutionary; the open, emergent nature sets the stage for discovery (Glesne & Peshkin, 1992). "The travels we take down the 'infinite path' can only be facilitated by a type of research that gets to the bottom of things, that dwells on complexity, and that brings us very close to the phenomena we seek to illuminate" (Peshkin, 1993, p. 28). A complex study involving teaching children in a learning environment lends itself to a qualitative inquiry. It is through qualitative methods that I seek to illuminate the metacognitive experience of children engaged in library research.

Role of the Researcher

For this study, I chose to be the "teacher as REsearcher" (Berthoff, 1987). Berthoff believed that teaching is REsearching--looking and looking again and this was paramount to creating "theory that is generated in dialogue among teachers" (p. 29). Britton has suggested that if research is viewed as a process of discovery, "then the day-to-day work of a teacher comes under the term teachers as researchers" (1987, p. 15). Therefore, in a classroom every lesson should be an inquiry for the teacher and reflecting, inferring, and planning further inquiry grows out of this "quiet form of research" (p. 15). Burton has stated that teaching provides substance for the research of teachers who "re-search" the experiences of themselves and the experiences of children. He has maintained that for teachers "the act of research enriches and illuminates their teaching" (1991, p. 230) and that there is a reciprocal relationship between action and reflection. Teachers' actions provide substance for their reflection and reflections influence future encounters with children. In this way, being a teacher-

researcher is also being a teacher and a learner. I realized that these views of the teacher-researcher paralleled views I had from my own teaching experience and presented a sound, meaningful approach to this study.

During this study I cooperatively planned and taught a thematic unit with a classroom teacher and the school's teacher-librarian. We worked within a school theme, Space, and created a five week unit plan for twenty-nine grade five students. The students were involved in writing a science fiction story into which they incorporated factual information about space. In order for students to do this they engaged in library research to gather information.

The *Focus on Research* model (Alberta Education, 1990) was used as a guide for planning the teaching unit. The *Focus on Research* model, shown in Table 1, promotes cooperative planning and implementation between teachers and school teacher-librarians for library research projects. This model outlines five stages of the research process and the skills within each stage. The stages include planning, information retrieval, information processing, information sharing and evaluation. During each of the stages, the process is reviewed. The teachers and students are encouraged to reflect on the activities they have participated in during each stage and to note specific ideas for improvement. At the introductory level, reviewing the process is teacher and teacher-librarian directed. As students become more advanced it becomes more student directed.

Kuhlthau (1993) has stated that assessing the process as well as the final product is an essential part of the process approach to information skills. During the evaluation stage of the *Focus on Research* model, research procedures and skills are evaluated as well as the product. Teachers and students reflect on the complete research process, noting areas of strength and ideas for improvement. As students become more independent, they note ideas that may be transferred to other situations. "Understanding the research process enables students to more intelligently use library sources and to transfer their ability to other situations of information need in other libraries" (Kuhlthau, 1985, p. 40).

Table 1

Focus on Research Model of the Research Process

Stages	Skills
Planning	• Establish Topic • Identify Information Sources • Identify Audience and Presentation Format • Establish Evaluation Criteria • Review Process
Information Retrieval	• Locate Resources • Collect Resources • Review Process
Information Processing	• Choose Relevant Information • Evaluate Information • Organize and Record Information • Make Connections and Inferences • Create Product • Revise and Edit • Review Process
Information Sharing	• Present Findings • Demonstrate Appropriate Audience Behavior • Review Process
Evaluation	• Evaluate Product • Evaluate Research Procedures and Skills • Review Process

Note. From Focus on research: A guide to developing students' research skills (p. 77), by Alberta Education, 1990, Edmonton: Author.

Research Framework

Metacognitive strategies were incorporated into the unit plan. Before the study, I created a framework to provide myself with a focus of aspects of metacognition and to assist in planning the teaching unit. This framework, outlined in Table 2, was developed after extensive reading about metacognition. As I surveyed the literature, I identified four common threads within metacognition on which to focus: awareness, planning, self-evaluation, and self-regulation. I also developed a set of criteria as guidelines for evidence of these metacognitive aspects demonstrated by students throughout the study. This would also assist me during data analysis.

Awareness is a term I felt applied to Flavell's model of metacognitive knowledge and the categories of person, task, and strategy that he outlined. Each of these categories implies that one must be aware and this awareness leads one to engage in an action or behavior. Abromitis (1994) and Marzano et al. (1988) have also addressed the awareness aspect of metacognition. The criteria I established for evidence of students' awareness during this study included conscious knowledge of thoughts and behaviors: written notes or oral comments about awareness of difficulties, awareness of inconsistencies, awareness of success or when needs are met, awareness of lack of success or when needs are not met. During data analysis I added criteria to this part of the framework, awareness of feelings, and awareness of knowledge (information, facts).

The second aspect of the Research Framework is planning. This element is probably the most tangible of them all. The evidence to support planning included estimating time requirements, organizing materials, scheduling procedures necessary to complete an activity (Blakey & Spence, 1990) and goal-setting.

The third aspect is self-evaluation. Marzano et al (1988) have cited a model by Paris, Lipson and Wixson (1983) where evaluation was defined as assessing our current knowledge state, whether or not we have the resources required for assessing a task, and assessing task goals and subgoals. Self-reflection is therefore an integral part of this process of self-evaluation. Self-evaluation requires reflecting on one's own

Table 2

Research Framework: Evidence that Students are Using Metacognitive Processes

Awareness

- conscious knowledge/awareness of thoughts and behavior (i.e. cause and effect, explanations)
- notes or comments about awareness of difficulties
- notes or comments about awareness of inconsistencies
- notes or comments about awareness of success or when needs are met
- *notes or comments about awareness of feelings*
- *notes or comments about awareness of knowledge (information, facts)*

Planning

- estimating time requirements
- organizing materials
- scheduling procedures necessary to complete activity (steps)
- goal-setting

Self-Reflection and Self-Evaluation

- reflecting on actions and assessing productiveness of actions
- reflecting on thinking and assessing productiveness of thinking
- student comments on how they dealt with difficulties
- asking questions of themselves
- recognizing the need to alter behavior or thinking
- referring back to original purposes and goals to monitor progress
- *qualifying statements about actions or thinking ("I learned...")*
- *reflecting/assessing past events and describing personal feelings (affective)*

Self-Regulation

- adjusting behavior to achieve goals
- adjusting thinking to achieve goals
- *evidence of governing one's own thinking*
- *evidence of governing one's own behavior*

Note. The italicized statements were added to the framework at the time of data analysis.

actions or on one's own thinking and assessing the productiveness of these. Evidence of self-evaluation during this study included students' comments about difficulties and successes, students asking questions of themselves, students' recognition of the need to alter their thinking or behavior, and students referring back to original purposes and goals to monitor their progress. During data analysis I added two criteria, qualifying statements about actions and thinking and describing personal feelings after reflecting and assessing past events.

Finally, Flavell (1979), Bertland (1986), Marzano et al. (1988), Fogarty and Ballanca (1993), and Li (1993) have all espoused the importance of regulation of mental processes as part of metacognition. From Blakey and Spence (1990) I adopted the term self-regulation. I used this term to refer to the process of one regulating one's own thoughts and actions to achieve a task or goal. Evidence of students engaging in self-regulation, according to this framework, included adjusting thinking to achieve goals and adjusting behavior to achieve goals. I later incorporated the criteria of students governing their own thinking and students governing their own behavior during data analysis because I felt that any evidence of intent to adjust thoughts or actions were also examples of self-regulation.

The Study

In qualitative inquiry the researcher becomes the primary instrument for data collection and analysis (Merriam, 1988). Qualitative researchers immerse themselves in the setting or lives of others and use multiple means to gather data (Glesne & Peshkin, 1992). With this in mind I immersed myself in a classroom with grade five students and used a number of methods to gain insight into students' use of metacognitive strategies in this study.

At the beginning of the unit I gave the students a questionnaire to fill out (see Appendix A). This questionnaire was my attempt to gain some insight into the kinds of research the students had previously experienced. This helped me to understand the students' perspectives and experiences with library research and to plan the unit

accordingly. The student responses on the questionnaires were later compiled and examined for emerging themes or patterns.

"The participant observer gets to see things firsthand and to use his or her own knowledge and expertise in interpreting what is observed" (Merriam, 1988, p. 88). In order to gain an understanding of the extent to which grade fives use metacognitive strategies while carrying out library research, I became a participant observer. I observed the students and collected field notes during most of the activities for this unit plan. I also kept a journal and wrote diligently after every session with students and the teachers in an attempt to reconstruct the experience. Here, I elaborated on my field notes and made notes of any changes, problems, successes or anything else that I thought important to recount. This reflective journal allowed me the opportunity to adjust my thinking and planning for students for following lessons.

Throughout the study, each student wrote in a journal and the statements in these "thinking journals" were coded during data analysis according to the criteria established in the Research Framework (see Table 2). The frequency of statements representing awareness, planning, self-evaluation and self-regulation was determined for each student. A statement, in this case, refers to an equivalent of an independent clause--not necessarily a complete sentence. The statements were compiled on a frequency chart. In this way themes and patterns could be determined.

One day's student journal entries were also compiled and coded according to the Research Framework aspects. The frequency of the kinds of statements was calculated for the journal entries of all the students for that day. This particular day's journal entries were selected as a sample because they were written by students after the first half of a library information retrieval session and before the second half of the same session. Thus, these statements were written in mid-stream in the library research process and students received no teacher guidance about what to write.

Conversations of students in small group and large group discussions (debriefing sessions at the end of a lesson) were audiotaped. I also audiotaped interviews with seven students at the conclusion of the study. To minimize gender bias four girls and three boys were selected. In qualitative research, "the interview is

used to gather descriptive data in the subject's own words so that the researcher can develop insights on how subjects interpret some piece of the world" (Bogdan & Biklen, 1992, p. 96). These interviews were intended to be informal and of a conversational nature; there were no established interview questions. Before the interviews, I reviewed all the information and work samples I had for each student. During each interview I talked about things relating specifically to these. I had hoped to encourage these students to relax and be comfortable in sharing their thoughts and experiences with me. "The interview experience holds a potential for the development of trust and commitment, and for the growth of a new human relationship, and of new or deepened understanding" (Weber, 1986, p. 66). These interviews allowed me to gain a deeper understanding of the students, their metacognitive experiences, and their research experiences.

The questionnaire responses and the statements on the interview transcripts were also classified according to the four aspects of metacognition. The numbers of statements for each aspect were calculated in order to generate a total for each aspect.

The following types of student work were collected and used for analysis: planning pages for stories called story maps, information retrieval webs used during library sessions, rough and finished copies of stories, and student self-evaluation forms filled out near the end of the unit. These were used to paint a clearer picture of the students' metacognitive and library research experiences.

Ethical Considerations

Permission to conduct this research was obtained from the school board, the principal, the classroom teacher and the teacher-librarian. Voluntary informed consent was also obtained from the students' parents and from the students themselves (see Appendix B). Permission to use students' work was also obtained from the students.

"Participants have a right to expect that when they give you permission to observe and interview, you will protect their confidences and preserve their anonymity" (Glesne & Peshkin, 1992, p. 117). Anonymity was promised to the

students in the reporting of this study. Within this report, pseudonyms have been used for the names of the students and for the surnames of the teachers. The right to privacy of all individuals was also considered and respected. My efforts throughout this study included treating all participants with kindness, consideration and dignity.

Summary of Methodology

This study of the metacognition of grade five students as they participated in the library research process was a qualitative inquiry. I adopted the role of teacher-researcher and planned and taught a Space unit with metacognitive strategies built into the unit. The *Focus on Research* model (Alberta Education, 1990) was used during the planning and teaching as a guide to the processes involved in library research. Grade five students wrote science fiction stories including factual information they had retrieved during library research.

A research framework was developed for this study and it consisted of four main metacognitive aspects: awareness, planning, self-evaluation and self-regulation. This framework and the corresponding criteria within the framework were used during data analysis.

Several sources of data were used for this study: student questionnaires, field notes, a reflective journal, student thinking journals, audiotaped student conversations and interviews, student planning pages, student evaluations, and student work samples. The data was analyzed to determine students' metacognitive and library research experiences.

CHAPTER FOUR

Description of the Study

Setting of the Study

Finding a suitable setting for a qualitative study can be a difficult task. I wanted the setting for this study to be one where the students had access to a wealth of library resources as well as the benefit of a strong school library program. I was aware of one particular school where this was the case. The teacher-librarian was interested and supportive. However, the teacher whose class I was interested in working with was not interested in participating in the study. This was discouraging for me. The setting was an important factor because I planned to work closely with the classroom teacher. I wanted an enthusiastic colleague with whom to collaborate and share this experience.

Teacher-librarians have a remarkable way of networking and sharing information. A friend of mine who was once the teacher-librarian at the school where I had taught, after hearing of my plight, mentioned the name of another teacher-librarian who might be very interested in participating in my study. I pursued this lead and called the principal to investigate the possibility of conducting a research study in that school. She thought there definitely would be interest in participating and encouraged me to contact Dawn, the teacher-librarian. After speaking on the phone with Dawn, I became excited at the prospect of working with her. Dawn indicated that she worked with a teacher, Vivian, who was taking school library courses at the university and was very interested in library research.

After talking with Vivian, I realized that she was most interested in the study. She informed me that she was taking a leave from school after spring break and hoped we would be able to work within that time frame. I arranged to come out to the school to meet with Dawn and receive an orientation to the school as well as to

discuss my research study. I would then go to the classroom to meet the grade five students and later have a planning session with Dawn and Vivian.

During my first visit to the school I realized that this would be a most suitable setting for my study. The library was very bright, spacious, inviting, and the use of technology was evident. The library was automated and several CD-ROM stations were available for use. There was a variety of software available for use. There was also a laser video disc (LVD) station where students gained information by viewing pictures. The library catalogue was available for searching for resources on three OPAC stations. There were a number of tables where students worked, a white board, and a rather extensive collection of books, including a reference section. The library had a smaller, adjoining room where fiction books were housed. The library was well equipped for library research.

The grade five classroom was quite small and there were no windows. It seemed as if it consisted of wall-to-wall desks. However, there were two vacant rooms adjoining the classroom; they held promise for group activities and places for students to spread out to do their work. There was a small, open corner of the classroom where we could congregate for discussions.

The class consisted of twenty-nine grade five students. This was a French immersion classroom and the students received approximately eighty percent of their instruction in French. Language arts, math, social studies and science instruction was in French. Vivian integrated French language arts with social studies. The grade five students also received language arts instruction in English. Vivian used a whole language approach with reader's/writer's workshop with her students. Students read novels for independent reading activities and novel studies were carried out with the whole class. The grade fives wrote in reader response journals in English and kept a French journal where they practised vocabulary and sentences.

The grade five students were well acquainted with the library. Vivian incorporated center time into her program every day for a forty-five minute period. Three of the dozen or so centers were set up in the library. Some examples of these library centers included a listening center for language arts activities, a research center

on authors and their books, and a video center where students could explore specific topics at the CD-ROM and VCR stations. These centers changed every month and new curriculum-based activities were incorporated. Each day there were always some of the grade five students in the library.

The grade fives had also been involved in a project using *National Geographic Kids Network* where they studied the foods consumed by children in other regions. The students tested food, e-mailed data to a central location, and communicated with students from all over the world who were also participating in the project. This grade five class was very experienced with using technology in library research.

In the library Vivian also taught units that had been cooperatively planned with the teacher-librarian. The class had just finished a social studies unit exploring the regions of Canada.

Planning the Space Unit

In an effort to develop a rapport with students, I introduced myself and explained that I was interested in working on a project with them. The students seemed interested and eager to participate in a project. The students introduced themselves and told me a little bit about themselves. I read a story to them--one on which a current movie was based.

The initial planning session with Vivian and Dawn was enjoyable and productive. I gave them an outline of what I wanted to do in relation to my study. Ideas flowed rapidly from everyone. We decided to teach a unit within the school's theme, Space. Vivian wanted to integrate this into language arts. After much discussion we decided to have each student create a science fiction short story, incorporating factual information about space to make their story believable. Dawn was interested in continuing in the role of teacher-librarian--assembling and reviewing resources with students, reviewing note-taking and strategies for information retrieval, and generally offering supportive assistance from the library. She also indicated a strong desire to be informed about everything we were doing concerning the study.

Later, Vivian and I met and set up a tentative five-week timeline for the unit plan, planning to finish before spring break. The timetabling was a challenge since we had to work around field trips, early dismissal, the one day every week when the class had another teacher, and teachers' convention. We realized that the amount of time we would be able to spend on this unit would be restricted by a number of other events. This was so typical of my years of experience planning and teaching throughout the school year!

Dawn and Vivian discussed the possibility of setting parameters for the grade fives in order to keep the assignment manageable for the amount of time we had. They thought the story could be a travel story. Vivian thought travel tied in really well after their social studies unit on regions of Canada. The students' stories could take place on Earth, another planet, or en route from Earth to a planet or from a planet to Earth. The number of characters in the story should be no more than five and the finished length was to be three or four pages. Vivian told me that she had some keen writers in her class and they might go on writing forever. Another requirement was that there should be factual information in the story. Vivian and I reviewed these parameters and concluded that this would be a good approach to the unit plan.

Vivian, Dawn and I communicated regularly throughout the study. We had meetings and talked on the phone and Dawn and I even attempted sending a couple of messages via e-mail. Sometimes we would alter something in our plan during a class, after a class, or just before class started. Communication was an ongoing process.

We set up a series of lessons. We scheduled when Dawn would teach information retrieval skills with the grade fives. Vivian would teach skills pertinent to the story writing. I incorporated metacognitive strategies for teaching students about awareness, planning, self-evaluation and self-regulation throughout the unit plan. The teaching of this unit definitely involved a cooperative, team-teaching approach.

It was difficult to come up with precise lesson plans for the entire unit initially since we moved in directions determined by students' learning and experiences as we went along. For example, at one point we realized that we needed to review how to put information on retrieval webs with students and to recheck for understanding

before moving on. At another point we saw a need to review the entire research process with the students and to have them determine where they were in that process and where they were headed. The students helped to point the way for our planning.

Carrying out the Space Unit

The first lesson with the students was one where Vivian and I revealed the topic for the unit and discussed the expectations we had set for the students. We then outlined with greater detail the activities they would be involved in and then invited students' questions. The students were excited and eager to begin. I also discussed the letters for consent and ethical considerations with the students and handed these out to go home and to be returned to me. At this time I had students fill out questionnaires about library research.

Later that same afternoon Vivian brainstormed about travel with the students and then turned the discussion to space travel. This brainstorming session went well and the grade fives were anxious to plan their science fiction stories. Vivian and I felt good about the response.

Lesson two was one where I wanted to introduce a thinking journal to the students. I generated responses from the class about how a thinking journal might differ from a personal journal or diary. I then showed students charts suggesting the qualities of statements that might be in each of these journals (see Appendix C). We then engaged in an activity where each student had a sentence strip with a statement for a journal entry. The task for students was to read their statement, determine which kind of journal it could go in, and tape it on the chalkboard under the appropriate heading--personal journal (diary) or thinking journal. When all the statements were classified, we discussed them. Some students realized that certain statements could go in either kind of journal. The last few minutes of class we had the students write reflective statements about the lesson in their new thinking journals.

The grade fives were excited during the classification activity and participated actively. However, when it came time to discuss what they had learned about thinking

journals, most of the students were reluctant to participate. Only six or so students participated in the discussion. I wondered whether the lesson was too difficult or whether the students were too shy to respond to me. I asked Vivian about this. She indicated that the students were like this most of the time--the same few students participated actively in discussions and the rest were quiet and tended to sit passively. I thought that this presented an interesting challenge--to bring the majority of the students into discussions. I hoped this would not be an indication of the response I would get when they wrote in their thinking journals.

After class Vivian, Dawn and I had our debriefing session in the library. We agreed that the lesson went well--Vivian liked the hands-on activity. We reviewed the information I had provided on the chart about thinking journals and added in another point. Some students could not move away from their belief that a thinking journal is secret. We expressed a need to work on this and to move students away from this notion. We felt ready for the next lesson.

At the time that I reviewed my Research Framework (Table 2) to determine how to incorporate the four aspects into the lessons, I decided to create sentence starters or stems for each category (see Appendix D). I thought these might be used to assist students with written responses. Giving students a selection of these stems to use would guarantee responses dealing with the metacognitive aspects. I also wanted to demonstrate the language that could be used. I did not want stylized responses in the journals but I did want to provide guidance for the students who needed it.

The third lesson consisted of discussion about the elements of a science fiction story. Students volunteered their ideas. We addressed story elements: characters, setting, conflict and resolution. On an overhead transparency Vivian showed a teacher-prepared story map and demonstrated how to use this story map to plan a story. We gave students the opportunity to begin planning their own stories on their maps (see Appendix E). They were excited about the many ideas they had for their stories.

I read over the students' story plans. Some sounded interesting; others sounded gory and involved little more than battling and killing aliens. Vivian and I

decided that we would talk with the class about creating an exciting, suspenseful science fiction story that does not involve killing. We did this at the beginning of the next class and when the students revamped their story maps we were pleased with the results.

In the next lesson Dawn gave information on planning for information retrieval and she shared a few formats from which students would choose. Dawn reviewed how to take notes, encouraging students to use RAP: R . . . read a little, A . . . ask "What did I learn?" and P . . . put it in key words or phrases. She also provided information giving students guidelines on how to acquire and analyze information. This lesson was long and the class was restless when we finished. We felt that there was so much information to condense in a very short amount of time. At the end of this session Vivian and I thought that a brief review and having a teacher model how to use their story plan to guide their library research would be beneficial for the students.

In the next class I used an overhead transparency of the story map and wrote in a plan for "my science fiction story." I then had the students generate topics that I should research to acquire information for my story: Mars, computers in space, space stations, space travel and space shuttles. I wrote these topics on a sample planning format (web). Together we generated several questions for me to explore about Mars. I hoped this demonstration would help to make this process clearer for the grade fives.

We had students choose an information retrieval format for themselves and then plan for the next day's library session. Most students chose the web format. Marcy chose "long skinnies"--strips of paper--because she could get more information on them. We thought having students plan at this time would encourage them to later view the library resources with Dawn more critically, speculating which ones would be the most helpful to them when they begin researching. After planning, the class moved from the classroom to the library where they received an orientation for the centers available for their space research: OPAC, reference collection, LVD, CD-ROM, space book center, and video center. Students were also introduced to some of the resources available at the centers. At the end of this library resource review, we

encouraged students to write reflections in their thinking journals. I put sentence stems on the board to assist them with their responses.

During our debriefing after this class, Vivian thought the planning demonstration made things clearer for the students and she was looking forward to seeing factual knowledge incorporated into their stories. We expressed frustration about the time; we felt very rushed. We also realized that since the grade fives were ready to go to the library, we needed a means to organize them--after all, the CD-ROM stations would not accommodate twenty-nine grade fives at one time. Dawn suggested making a chart for the class with students' names and the centers and have them number three choices where they planned to go. We decided to tell students maximum numbers of people who could attend one station at a time. We also limited the time spent at certain stations. In this way we would be able to monitor where students went and include an element of fairness to this endeavor.

The sixth lesson began with a review of elements of a thinking journal and a supporting handout for students to include in their research folder (see Appendix F). I then focused on awareness and planning, referring to the criteria outlined in the Research Framework. I had the students generate example statements and listed them on the chalkboard. I showed an overhead transparency of a sample plan that I had written for myself for my activity in the library (see Appendix G). This sample plan included a number of statements showing awareness and planning. We discussed this plan and students picked out the statements showing awareness and determined which planning statements told about organizing materials, setting goals, and so on. Then we had the grade fives spend ten minutes writing their plans for what they intended to do in the library.

After this we moved to the library to retrieve information. The students seemed very eager to begin. There was great excitement at the CD-ROM stations. Connie was using her research "web," taking notes. Trevor copied down Dewey Decimal numbers as he searched on the OPAC. Rhonda was searching for "stuff about space and the moon" on the OPAC. Kathy told me it is minus forty degrees

Celsius on Mars. Wherever I went the students were most eager to share information with me. Students were checking the chart to see where they should go.

At the space book center, Alice decided to change her planet after discovering that Saturn has little land on which to land. This impressed me. Alice seemed to be carefully considering the information for her story. Another girl was writing down information. I thought she had a lot of information and some of it did not appear to suit her purpose. I talked to her about finding relevant information. She looked at me sheepishly and admitted that she was getting carried away. Some students marveled at the wealth of information they found at a particular center.

George looked like a lost soul in the library. He did not bring his research folder, nor did he appear to follow any kind of plan. George moved between the groups. He wandered from the space book center to the reference center, talking to those who were working. I thought it was interesting how the busy students seemed to ignore this interruption and continue working.

Kari spent a long time at the LVD center. She told me she was waiting for a CD-ROM station. The time spent waiting was not very productive for Kari. However, she did not seem to be interested in looking at any other centers. The technology centers seemed to be the most popular for the students.

We concluded this lesson with a class discussion about their experiences. Students were most enthusiastic about sharing information tidbits they had gathered in the library.

I had mixed emotions about this session. It was exciting to watch the interaction of the students in the library. I felt that most of the students were enjoying the research process. I also felt positive that some of the students were relaxing and relating to me. Alice seemed quite interested in showing me her book of information and talking about what she had found. Jenelle and Tammy were attentive and interested in what I had to say. Trevor approached me about bringing pictures of planets from his CD-ROM program at home and putting them up in the classroom.

This session was also a little frustrating. Vivian and Dawn were both absent for this lesson and the students were less focused during the awareness and planning lesson in the classroom.

In their journal plans, most of the students wrote about the centers they planned to visit and a few referred specifically to topics or information they required. The entries were quite brief. They did not include statements about time elements, materials required or steps to achieve goals. This was disappointing to me because when I presented an example plan to them, I tried to provide one that was very detailed and comprehensive. I decided to begin lesson seven having students generate elements of planning and awareness to see what they could tell me. I reinforced these concepts and emphasized that this time in their thinking journals I wanted them to try to address all of the elements of awareness and planning. I provided a chart of sentence stems to assist students with this.

After journal writing we moved to the library where the students continued with information retrieval activities. We stopped just before recess. After recess students wrote in their thinking journals. This writing was unprompted by myself or the other teachers. Dawn thought this journal entry would be a good example of students' thinking in the middle of the library information retrieval process. We then returned to the library for the rest of the afternoon. The time in the library seemed to be even busier this lesson; this time students who had been a little slow to get started seemed to be more on task. We had a full squad for this library session--Vivian, Dawn, and I all moved among the students giving encouragement and assistance when it was needed. I noticed that most students did not require much help. They were focused and seemed to know exactly what information they wanted and how to go about getting it.

George was especially focused. He came to the library equipped with all the necessary materials and worked steadily until it was time to stop. I approached George and commented on how hard he was working this day. He told me he wanted to get his work done. He also said he had thought about what he did last day and

realized that he needed to work. I encouraged George to write about this experience in his thinking journal when we returned to class before recess.

Trevor brought information on Mars that he had printed from his home computer. He sat at a table for a long time with this information but he did not read it. He had no information retrieval page with him. I approached Trevor to try to steer him in a more productive direction. He expressed no desire to read the material on Mars that he had because "I can bring them home." I later reflected in my journal on the conversation I had with Trevor:

He told me some of his plans. He was able to get to one of the centers he mentioned but got no information. I observed him wandering at centers taking no notes. A couple of times he was "waiting for Danny." He thought he was "pretty much" successful although he had no information. Trevor seemed to not realize a need for taking notes, or to accurately assess his progress.
(March 5)

I also discovered in our conversation that he had changed the topic he was researching from the previous day. Trevor planned to look on the OPAC, but he was very vague about what information he was searching for.

I circulated among the students and made notes of my observations but I seemed to get more information by talking with them. During the last part of this class I led a class discussion in order to gain an understanding of the grade fives' perception of their library experience. Students shared information about where they got information and where they could not find information for their research questions. Few students talked about difficulties. Where they hesitant to admit they had problems or were there no problems? Terry told us that people around her were talking and she could not get any work done so she moved. Rhonda's problem was getting the information she required about the moon. She thought she might find what she needed at the Space and Science Center, an Edmonton facility that has space-related activities and information. She did not mention checking another center in the school library--Rhonda spent most of her time at an OPAC and a CD-ROM center. As far as I knew she did not ask a teacher for help.

During our teacher-debriefing session after lesson seven, Vivian and I discussed the need to have the students examine their information retrieval webs and relate this information back to their stories as a review of the purpose for their research. This might help students to limit information that was not relevant and retrieve other information that they did need for their stories. We noticed that many students had a great deal of information on one topic and little or no information on their other topics.

I thought that the next lesson would also be a suitable time to introduce the metacognitive aspects self-evaluation and self-regulation. After all, would reviewing information retrieval webs and assessing information needs not facilitate self-evaluation? We were expecting students to assess the amount and kinds of information they had acquired. We were asking students to conduct a needs analysis and to redirect their searching and information gathering behavior accordingly. It seemed to me that limiting information collection and retrieving different information involved self-regulation.

Vivian and I also talked about how we would approach the storywriting segment of our project. We speculated--should we have students go through their information and highlight what they will use? Do we give the grade fives free rein to write their stories, observing their own methods? Vivian expressed a desire to spend time exploring beginning paragraphs with the students, talking about setting, introducing the characters and setting up the problem in their stories. We both agreed that this might be a good start for the storywriting segment of the unit.

Lesson eight consisted of having students examine their story webs and information retrieval planning pages, and evaluate their progress thus far. I introduced the term self-evaluation and emphasized that self-evaluation requires reflecting, monitoring and assessing thinking and actions. I used the term self-regulation and talked about how regulating thinking or behavior may be necessary in order to achieve goals. We discussed these concepts relating them to the experiences of the students. The students gave examples.

We spent the next hour in the library. Vivian and I decided that this would be our last information retrieval session for the class as a whole. Before we left the library, the grade fives wrote reflective and evaluative statements in their journals. Sentence stems were provided to elicit responses that were self-evaluative as well as self-regulatory.

I noted in my journal that the class seemed quite involved in their journal writing this day. I also thought that next lesson would be a good time for students to reflect on what they had done up to that point, where they were at that time, and the direction they were heading in the research process. The students were using research folders developed by the Alberta Learning Resources Council. On the folders were printed the stages of the research process and corresponding elements. I decided that we would refer to these for this review.

Vivian and I thought the students were ready to begin writing so we decided to begin the next lesson. We agreed to meet at Vivian's home to plan the next week's lessons. We also planned a culminating activity for the last day of our project. We thought having a luncheon and having students orally share their stories would be a nice way to wrap up. The luncheon would be an international potluck where each dish was representative of a person's cultural heritage. Vivian's class had previously participated with students from locations all over the world in a study of food.

These planning meetings outside of school were most helpful. We were able to discuss at length with little interruption or time constraints. I left the thinking journals with Vivian so she would be able to see what the students were writing as well as my comments. Vivian later told me that after reading the thinking journals she was able to tell who was aware of what they were doing. She was impressed with Reagan's entries because she was seldom on track with assignments but seemed more focused in her journal. These comments were valuable to me. Vivian knew her students well and I appreciated her perspective and her comments.

The next lesson I reviewed the research process with the class. We asked Dawn if she would like to do this, but she was attending an inservice at the time. I hoped this brief review would clarify in students' minds the stages of the library

research process they had completed, the stage they were moving into--information processing--and what the final outcome would be. However, there was little active participation from students even though they had their research folders with the stages of the research process laid out in front of them.

It was difficult to find suitable examples of introductory paragraphs that effectively illustrated the story elements we wanted to show students. I tried to find examples that were narrative and of the science fiction genre. This was difficult because most of the stories I found were novels and in a three page story we would not be able to take three or four paragraphs to introduce the characters and the setting. However, I found two examples, one of which was from a science fiction story. The paragraphs worked well. We put them up on overhead transparencies and students were able to pick out the elements of character, setting and the hint of possible conflict. Vivian drew students' attention to descriptive vocabulary. This part of the lesson generated more interest and participation.

The writing session was phenomenal! The grade fives wrote non-stop and seemed to be extremely focused, knowing exactly the direction their stories should take. Vivian expressed surprise and delight that no one had writer's block. She said that typically there are a few students who have problems getting going during writing activities. She told me that Rhonda usually experiences writer's block but we observed her writing incessantly. I wondered if this was the result of extensive planning for the stories.

Much of the research about writer's block has been carried out with young adults. There seems to be little research available about writer's block and elementary school children. Rose (1984) defined writer's block as "an inability to begin or continue writing for reasons other than a lack of basic skill or commitment" (p. 3). Writer's block may be characterized by feelings of frustration, anxiety, anger or confusion and there is limited productive involvement in the writing task. There have been behaviorist, psychoanalytic, and sociological/political models that consider writer's block. Rose conducted a study that showed the cognitive variables that were involved in writer's block. According to his study, lack of appropriate planning and

discourse strategies were possible reasons for writer's block. Smith (1982) has viewed writing blocks as being primarily procedural or psychological in nature. Procedural writing blocks are those that occur when one cannot decide what to write next and psychological writing blocks are when one cannot bring oneself to write anything next.

Various techniques have been proposed to overcome writing blocks and to promote fluency when students write. Such prewriting activities for students include brainstorming and freewriting (Tompkins & Camp, 1988), outlining (Flower & Hayes, 1980), and producing a summary statement of what one wants to write about (Smith, 1982, 1994). Flower and Hayes (1980) have stated that planning allows writers to reduce the number of demands being made on their conscious attention.

We did not talk to students while they wrote. Vivian and I felt it was important to not interrupt their flow of ideas. After all, many students were anxious to get to this stage!

We ended lesson nine with a class discussion. I wanted students to share their thoughts about the process they experienced. I hoped for discussion that was an oral version of thinking journal entries. However, students were most enthusiastic about sharing what their stories were about. A couple of girls indicated that they changed their story from their plans in order to shorten them. We ran out of time before we were able to move most students beyond sharing stories to sharing their thinking.

At this time I was very curious about how students would incorporate factual information into their stories. We did not structure this task for them. Except for occasional reminders about including the factual information they researched, we let students go ahead independently in order to see what they could do. I decided to closely monitor how students engaged in this process.

Lesson ten changed slightly from the original plan. I intended to show the criteria for their story evaluation and Vivian was going to go over elements of the body of a story before students wrote their stories. However, the grade fives wrote in thinking journals first and went on to continue with writing their stories. This change in plan was because Vivian had to go to the school's office at the beginning of the

lesson. During the storywriting session I observed a couple of students referring to their information retrieval pages to insert some information into their stories, but most students wrote busily without referring to their facts.

After the storywriting session we reviewed the criteria for evaluation of stories on the overhead and invited student questions. There were no questions from students. Vivian proceeded to talk about the body and conclusion of a story as well as paragraphing, and use of descriptive vocabulary.

We concluded with a class discussion and some common problems emerged. A few students found they had to shorten their stories in order for them to fit into the parameters we had set. Some were experiencing difficulty determining where to put the factual information and the story conflict into their story. What was easy for students? They told us it was easy using the space books and *World Book* encyclopedia on CD-ROM, and it was easy to write their stories because the ideas kept coming. Someone suggested that the planning was helpful. After determining where students were in their process, Vivian and I realized that some required more time for writing, others needed to return to the library to search for specific information, and a few were ready to edit their work.

The next lesson we concentrated on storywriting and editing. Vivian reviewed the editing process with the class. This was a familiar process to the grade fives and they were given an editing checklist to use--one that Vivian had previously used with them.

I spent some of lesson eleven reviewing the four aspects of metacognition. I wrote them on the chalkboard and led a class discussion. Which of these might students be using as they edit their stories? Someone suggested self-evaluation--assessing what one had written. Terry volunteered awareness. No one suggested self-regulation so I explained that this would be what they would do if they changed something in their story. They would change their thinking and, as they determined a need, edit accordingly. Kari suggested that if you read your story and if it is all right you would leave it. I indicated that this would also be self-regulation, monitoring what you have done and preventing yourself from altering it. I tried to relate the self-

evaluation and self-regulation processes to the editing that would be taking place. Vivian's feedback on this part of the lesson was positive. She thought the metacognitive concepts we were teaching were clear to the grade fives.

We then had students sign their names on the chalkboard in designated places to let us know whether they were ready to edit their stories with a peer or whether they needed to return to the library to find more information. Since we were approaching the final week of the study we encouraged students to finish their stories. We set up peer editing with partners for the students who were ready. Vivian monitored this activity in the classroom. I went to the library to assist students who might need help finding information they required.

In the library some of the students had very specific questions they needed to answer. Kathy needed the name of a space shuttle part that could be easily fixed, Shawn wanted to know the distance from Neptune to Saturn, and Rhonda knew she wanted to answer a question about the moon. Terry was focused, reading for the information she wanted.

The behavior of the students at this time was similar to their behavior during other information retrieval library sessions. Students who were focused and productive in previous sessions continued to be focused and productive. Students who experienced difficulty focusing before, experienced difficulty at this time. I noted and questioned a number of things, later, in my journal:

Interestingly, the same students who floundered and spun their wheels during the previous information retrieval sessions also floundered today. Danny and Daniel left without anything. Daniel didn't seem to know what he needed; he latched on to Ben and copied information that Ben pulled up on the CD-ROM. Shawn floundered slightly but he was able to come up with a piece of information that satisfied him. Does this have to do with a lack of awareness? Or are they aware of difficulties but unable to redirect their thinking and behavior? How can we help them? When I approached these students they indicated to me the information they needed although it was vague. Danny and Daniel were reluctant to act on any of my suggestions and for the most part didn't. Do they not see the whole of what they are trying to do? (Journal, March 13)

During lesson eleven I reviewed the library research process with students and they determined where they were in that process. Vivian talked about evaluation of the stories and the grade fives filled in a self-evaluation page for their stories. We then had students break into small groups to discuss their experiences during this project. I listed some guiding questions on the chalkboard and audiotaped two of the groups. After the small group discussions, some students continued to peer edit while others began to write their good copy. Some students used lap top computers to do this. I noticed how adept they were at operating the computers and printing out the results.

Later when I reflected on this lesson, I realized that Vivian and I had students formally evaluate the product of this library research but we neglected to have them formally evaluate the process. I outlined some evaluative questions for students and decided to have them write an evaluation in their journals. Vivian let me know that our celebration luncheon with students and the sharing of the stories would take place the next day since Vivian would not be at school the last day of our science fiction story unit. We planned to spend the next afternoon having our luncheon and then sharing stories. Vivian would have students write evaluations in their journals in the morning. I gave Vivian a list of questions to write on the chalkboard to guide students while they did this.

On the day of our culminating luncheon I was amazed that this part of my research study was over. I delivered some muffins and a thank you card to the staffroom for the warm, friendly people who welcomed me into their school. Unfortunately, Dawn was unable to attend the luncheon but I saw her briefly before I left the school that afternoon. I later presented Dawn and Vivian each with a small gift and card expressing my appreciation for the large part they both played in my study.

As I approached the grade five classroom some of the students greeted me, exclaiming, "Here she is!" and led me into a large room across the hall where our celebration was going to take place. When I entered the room I was greeted with smiling, expectant faces peering above tables covered with colorful paper tablecloths that students had decorated. There were other tables covered with exotic foods. Students showed me where I should sit. There was a placecard with my name on it.

There was an overwhelming feeling of happiness and excitement in the room. Among the guests were a few parents of students, the vice principal, the class' Friday teacher, and the teacher who would be taking over the class after spring break.

After our delicious luncheon we moved back to the classroom where students volunteered to share their stories. Most of the grade fives were so eager to read their stories! I noticed how proud and excited each student was as they shared their story. The audience was most attentive. I marveled at the appearance of the finished stories. Students illustrated their stories and created elaborate title pages; some made theirs into books, some typed their finished copies on computer, and some had handwritten them. It was also obvious that some students truly cherished their work.

That afternoon I left the school feeling satisfied but reluctant to part with this vivacious group of grade fives who had occupied so much of my time and thoughts the last few weeks. I planned to return the following afternoon to conduct individual interviews with some of the students but, for the most part, my research experience with these grade five students was over.

CHAPTER FIVE

Presentation of Data

Analyzing the Data

It was exhausting uncovering evidence of students using the metacognitive aspects I outlined in the Research Framework (see Table 2). There was a lot of data to go through. The data sources for my research began with the questionnaires that students filled out before we started the project. Data from class and small group discussions, observations and field notes, student interviews, my reflective journal and students' thinking journals were used. Samples of students' work throughout the unit and a story evaluation page that students filled out near the end of the unit were also used for analysis.

Coding journal statements was a particularly onerous task. I worked on this on many different occasions. Every time I read through the grade fives' statements I found myself discovering something that I had not found the time before. At times I second guessed myself about certain coding decisions I had made. I wondered about the Research Framework I had created and the aspects I had outlined. I found myself in a dilemma about having set up a framework with four rigid categories. How dare I classify children's language like mechanical utterances that would fit neatly into prescribed categories? These were some of the thoughts I had as I processed the data.

I totaled the number of journal statements from each student for each of the four categories and compiled them on a chart. This would help me to look for emerging patterns and relationships that might exist. This chart, with the students listed in random order, is shown here as Table 3.

Table 3

Frequency of Statements in Students' Journals

Name	Awareness	Planning	Self-Evaluation	Self-Regulation
Elizabeth	22	11	22	2
Jenelle	14	6	15	2
Kathy	28	12	29	2
Shawn	20	9	18	3
Richard	17	2	16	1
Aaron	17	8	18	1
Karen	19	17	17	0
Ben	22	9	18	0
Tim	19	10	18	3
Margaret	20	6	14	4
Terry	34	5	33	4
George	28	10	23	5
Reagan	28	11	23	4
Connie	26	10	19	6
James	25	10	19	1
Tammy	24	12	24	2
Marcy	21	8	17	1
May	23	10	24	7
Alice	20	9	18	3
Stewart	33	11	25	2
Mary	14	6	17	1
Sam	14	6	17	1
Kari	25	10	20	4
Trevor	13	11	12	1
Rhonda	22	10	18	2
Amy	39	14	33	1

The results of this extensive data analysis showed considerable evidence of students using metacognitive strategies. Four main themes emerged. The data revealed information about the four categories explored in this study: awareness, planning, self-evaluation, and self-regulation. These four aspects of metacognition appeared to be integral parts of the library research process.

I discovered that there was a great deal of overlap between the metacognitive aspects. Many statements that were self-evaluative were also examples of awareness. There was evidence of planning in self-regulation statements and evidence of awareness in self-regulation statements. There were examples of awareness in the planning sentences. Because of this overlap of the metacognitive aspects, some of the students' quotes have been repeated in different categories of the data presentation.

As I wrote, I found myself going back to the data many times. I grouped written statements and comments according to particular aspects that fell within the main categories. For example, for the awareness theme I found statements that exemplified awareness of self, awareness of knowledge, awareness of tasks and strategies, awareness of behavior and experiences, awareness of difficulties, awareness of success, and awareness of other people. In order to give a thorough account of students' thinking, it was necessary to group students' statements from their journals and other data sources in this way.

Where I have quoted from students' questionnaires and their thinking journals I have quoted precisely the grade fives' statements. I made no changes to the grammar, spelling or punctuation in the written examples. Excerpts pulled out from a longer text cannot give the reader a complete picture of the communication that occurred. At times, students' comments may challenge the reader to understand the intended meaning of the language. Knowing the context from which these statements came helped me to interpret the data. It is my hope that the extracts help to give the reader a richer sense of the nature of the data.

Awareness

Awareness is a metacognitive aspect that students demonstrated throughout the study. The Research Framework criteria for determining awareness was conscious knowledge of thoughts and behavior, notes or comments about awareness of difficulties, awareness of inconsistencies, awareness of success, awareness of feelings, and awareness of knowledge. When I coded the journal statements, the frequency of statements showing awareness was higher than that of planning and self-regulation statements and surprisingly close to the frequency of self-evaluation statements.

As I reviewed the data over and over again, it became clear to me that awareness was a complex phenomenon that had many facets. A number of different kinds of awareness seemed to emerge.

Awareness of Self

I noticed that students were very aware of themselves. They were aware of their own feelings. During an interview Terry said, "I like doing research and I think it's fun." Some statements in the students' journals also expressed awareness of feelings. Kathy wrote, "I really enjoyed the work and the research that we've done at the library" and Rhonda felt "glade that I can wright more over my story."

Students expressed what they liked about other research projects on the questionnaire. Aaron liked going to the library to find facts because he thought it was fun. Ben liked the experimentation that he did because when he tested different foods they would turn different colors. Reagan liked when she finished because "it was such a relief." Tim liked the computers because he felt they were more fun and easy to use. Amy wrote this comment on her questionnaire:

I liked it because doing our panflet was alot of fun. It was fun because we got to do anything we wanted in the panflet as long as it had information about our region.

When I interviewed Kathy at the end of the study she told me that she thought the work in the library was fun. What made it fun? Kathy was aware that the "neat stuff I

was collecting . . . ideas and information about space" made library research an enjoyable experience for her. Students showed that they were aware of their feelings and what they liked.

On the questionnaire students indicated that they were also aware of what they disliked during research projects. George did not like looking for "other words that mean't the same." He felt that looking for key words or descriptors for searching took too much time. Alice did not like presenting in front of the class because she became embarrassed. Marcy did not like having to write the "real" copy for her group. After one library session, when Trevor wrote in his journal, he drew in the margin a cartoon face with a balloon that said, "I don't like this." I later asked him what he did not like and he said that he did not like the thinking journal because he could not do all the things that he wrote in it.

Students selected resources or centers to use that appealed to them for different reasons. After an orientation to the resources that students would be using, James wanted to use the computer "because I like computer's and I really want to find out what happes at the end of that video" (Journal, February 28). Kari wanted to use the CD-ROM "because it is really fun and I like watching movies" (Journal, February 28). Many other students also expressed that they wanted to go to the CD-ROM stations. Margaret wanted to use the LVD because "I like looking at pictures because I think that their neat and you can get good information from just looking at the picture" (Journal, February 28). Karen concluded that "The LVD was difficult for me because it had no words or sentences to explane the picture" (Journal, March 19). Were statements like these evidence that students were cognizant of how they like to learn?

Students showed that they were aware of their own strengths and limitations. This awareness came through clearly in a few of James' comments in his journal:

I'am awhree that I well have a hard time. (March 4)

I'am better at rigthing story's. Because I like team more and I have a very good idea of what I am going to right and I like too write story because I'am a good writer. (March 7)

The Defacult part for me was getting my Recarch done because I realy wante to get to work on my story. The easy part for me was to write my story because I new what my story was about and I like to write story most of the time. It was difficult for me to tink about my work because I was arond my friends. (March 19)

James showed awareness of his limitations when he said he was aware that he would have a hard time--referring to researching in the library. He showed awareness about what was easy and difficult for him and what he felt most comfortable doing. He showed awareness of his feelings when he said he liked to write stories.

Other students wrote about what they found easy and difficult and indicated that they had reasons for doing things the way they did. The following journal excerpts were examples of this awareness exhibited by the grade fives:

I think I did very well in evaluating my story and it was also easy because I did not get disturbed, I was very quiet the whole time. (Alice, March 19)

Next time I will try to do something different because I am mostly reading books. The reason I'm always at the books is because I always get alot of information reading the books. (Tammy, March 7)

When I was writing my story I had really good ideas. It was very amusing. (Mary, March 12)

I don't like to write storys because it's just to hard. (May, March 13)

My evaluation went very well. But a problem was it's hard to find mistakes in your own story, because you correct, the way you think. (May, March 19)

When students were asked to respond in their journals to a question asking whether or not a thinking journal was helpful to them, Tim wrote, "No, I don't think it was very helpful beacause I didn't need it to give me anything for my story." Tim was aware that a thinking journal held little value for him. Megan was aware that she did not like using the thinking journal "Because I wanted to find more research and it wasts away when I had to do my thinking journal" (Interview, March 20). Other students responded differently:

My thinking Jornal was helpful for me. Because the comments that Mrs. Roche gives are relley helpful. (Ben, March 19)

I did find my thinking journal helpful because I could write steps I'm going to take and always look back to what I wrote. . . . I found it easy because I'm a talkative person and I think thinking journals are a good way to talk/write about your thinking. I like journals. (Terry, March 19)

Writing for me in thinking journal was easy. Because I knew what I was going to write and I already planed in my head. (Karen, March 19)

My thinking journal was helpful to me because it could keep track of what I did. (Aaron, March 19)

Yes my thinking journal was very helpful beacause I didn't know what I was doing, but when I thought about it, it all came clear and I wrote it down. (Margaret, March 19)

Students seemed to be aware of their own thoughts. This was evident in thinking journal statements where students reflected on thoughts they had. Some of these statements showed thoughts about research:

I think I will find lots of information on the computers because of all the programs. (Tim, March 4)

I know that today I got my mide set on a book I want to read on pluto. (James, March 5)

I think I'll find lots of information in the internet at home. (Sam, March 5)

There was evidence of pondering and speculation during the research process:

I will probaly take about 15-20 minutes at the CD-Rom. Except I probably won't get in because a whole bunch of people wan't to do that one. (Terry, February 27)

I doubt that there will be anything on the great red spot because I haven't found anything on it . . . (Elizabeth, March 5)

Elizabeth wrote in her journal after editing her story, "I'm sure that I have more mistakes than what I found but I did the best I could at finding them" (March 19).

Terry thought about what she learned when she wrote, "I think that what I learned will help me to get a better idea of what information I need to know when I go to the library" (February 27). She was also aware of thoughts she had about her story:

I had some difficulty evaluating myself because I still thought my story needed more work. But since we were running out of time I couldn't fix it.
(March 19)

When George wrote about his getting more work done one day, he stated, "I thought that I had to catch up on my work so I can get more work done" (March 5). Margaret stated that "I thought that it was pretty interesting" when she learned something new during a lesson (February 27). Amy revealed that she "thought about what I was going to write before I wrote it" (March 19) when she wrote her story. All of these statements demonstrate that at times students were cognizant of their own thoughts.

Awareness of Knowledge

Throughout the study students were aware of their knowledge and the learning that was taking place. In class discussions, in conversations between students, in journal entries, and in the interviews I held with students, their enthusiasm for sharing what they were learning was evident. Students were aware of the knowledge they already had and aware of new knowledge. Students were aware if information was different or contradicted what they already knew. During one library session I audiotaped a conversation between students and when one student was talking about the first American voyage to the moon another student replied, "I thought it was just Neil Armstrong." One grade five student told me that she had to change the setting for her story after discovering that the planet she chose had very little land on it. This showed awareness of new information as well as awareness about the needs of her story. Reagan wrote in her journal, "But my friend saw that Jupiter is the fastest to move around the sun. But I saw in CD ROM that Mercury moves around the sun the fastest" (March 5). Reagan was aware that there were inconsistencies in information when she was researching.

My observations and field notes also depicted the students' awareness of the information they were gathering and the eagerness of students to share their information. I wrote in my journal one day after listening to the students during a library session "... students seem to be aware of their information and are mentally

planning their stories as they gather information, incorporating interesting facts as they go" (March 5). During a class discussion Jenelle talked about how she put information in her story. She incorporated the temperature of her planet in conversation among the characters. This showed that she was aware of what she did with her information.

The students' journals had numerous statements about facts and their learning. The following statements are some examples:

The Personal Journal contains stuff that happened or something private. The think Journal contains ideas you use and questions you ask your self. This is why they are different from each other. (May, February 22)

Today I did some reviewing and I learned something too! I learned what micrometeoroids are. Micrometeoroids are particuals of dust. (Elizabeth, February 27)

Today with Mrs. Kelly I learned more on being a researcher. Like if your going to write a story, you can't just all of a sudden begin to write. You have to know information on what your writting. (Amy, February 27)

One of the most interesting facts that I found out that Triton is 355,000 K.M.s away from Neptune. (Connie, March 7)

Enthusiasm for learning was evident throughout the study.

Awareness of Tasks and Strategies

It was evident in the journal entries that students were aware of tasks or sub-goals as well as aware of the means to achieve these tasks. Kari wrote in her journal:

I know I need to research the moon and how it looks and the gravity. I need to look at how my space ship will look and what kind of suits I need to wear. I hope that I will have lots of fun and I still need to work hard. (March 4)

Kari was aware of what she needed to research and the personal effort required from her. She was also aware that she likes to have fun. Awareness of tasks and awareness of the strategies to meet the demands of tasks were evident in the grade five journals:

I am now ready to begin my search in the computers the inciclopedeas and Magazines after Ms. Kelly came to talk about the resorces in the library. (Richard, February 28)

I'm not ready to do my research beacase I have to finish my story map. (Alice, February 28)

I was not able to finish my task becaus I couldn't find my story map. (Shawn, March 4)

I have to find the book frist. (James, March 5)

Today I know I need to chatch up and I will try hard. (Shawn, March 5)

I need to work on the clothes that the astronauts where, so that I can write about the clothes in my story. (Kathy, March 7)

I need to scan out books on the moon so that I can know more about the moon. (Rhonda, March 7)

I put the info in by reading bitts of info at a time when I need it. (Richard, March 13)

Students also showed an awareness of the materials and resources that were available and awareness of the benefits of using particular ones:

I am ready to use the CD Rom because I have expierients with the CD Rom and it will go much quicker than the world "book" encyclopedia. (May, February 28)

When I do my research I'm going to work with the CD-ROM beacause it has alot about space. I'm also going to use the LVD because it has alot of good pictures. (Elizabeth, February 28)

Today I am going to try to go on the CD-Rom, because I heard that they have all the Information I need on space craft's. (Terry, March 5)

I know I need to bring a pencil and a piece of paper. (Karen, March 5)

There wasn't as much information in other resorses but there was lots in the books. (Tammy, March 19)

As these students planned for themselves their journal statements showed an awareness of what resources or strategies they intended to use in order to meet the demands of the tasks at hand.

Awareness of Behavior and Experiences

The data also revealed that students were aware of past experiences. This was evident in the responses on the questionnaire that the students filled in at the beginning of the study. Students were able to recount past experiences with research projects and some of the resources they used. Evidence of awareness of past events was also present in the student journals. Brian wrote in his journal, "Yesterday I started my science fiction story. I got some good ideas down on that one page" (March 12). Students wrote about where they spent their time in the library and what they had accomplished. During class discussions students talked about their experiences in the library. These comments required that students be aware of what they were doing.

Students showed awareness of how things went for them and speculated about their behavior. Marcy thought that she "took too much time on other questoins" (Journal, March 7). Shawn thought that "the reason for me to be so successful is because I didn't talk to anybody" (Journal, March 7). When George wrote in his journal about fooling around during class and not getting anything done he showed that he was well aware of his behavior. However, there seemed to be varying degrees of awareness among the students. Although George was aware of his behavior and that a certain kind of behavior was unproductive, Trevor did not exhibit this same awareness. During one session in the library I spoke with Trevor and it was evident that he was not aware that his mode of behavior was unproductive. He thought that he was successful sitting with an information source in front of him but doing nothing with that information.

When I interviewed Terry at the end of the study she expressed awareness that she could have put more information into her story. She also said that awareness was something she used during the study. The example Terry gave was "when I was reading my story, I realized that there wasn't enough information. I had to go back to the library and that's kind of awareness" (March 20). Terry was aware of this past experience and her behavior. She was aware that she needed more information. Terry was cognizant of her own awareness.

Awareness of Difficulties

Students were aware of difficulties or what they did not like during this project and other projects. Responses on the questionnaire showed that students were aware if there had been problems during other research projects:

Sometimes my group didn't work well. (Marcy)

Sometimes we would get the wrong information. I got a magasin with the wrong region. (Tim)

We had a little trouble finding some really important information we needed. (May)

We had a couple of problem's with looking in the C. D. Rom. We had to look up othe words that mean't the same. (George)

The students' journals revealed that the grade fives were aware of difficulties during the science fiction story project:

My research didn't go so well. I hardly got any information in the books. I didn't get any information on the LVD. (Mary, March 5)

On the movie therie was no information I needed for my book because I needed information on the moon and space crafts. (May, March 7)

At first it was difficult beacaus I couldn't find anything on mars . . . (Tim, March 19)

The diffecelt part was when I got lots of Idias in my head and I whanted to put them all in my story. But my story has to be short so I countd. (Rhonda, March 19)

What difficult for me while I was doing my reserach was that I didn't know whether I would use something or not use something. (Margaret, March 19)

During our interview I asked Kathy if she was not successful in doing something how would being aware of it and thinking about it be helpful to her? She replied, "Well next . . . it would be helpful to me because then next time I would go to the library and I would, like, know that I have to do this instead of working on all that stuff."

Awareness of Success

In addition to being aware of difficulties the grade fives were aware of successes. After an information retrieval session in the library, Ben wrote in his journal, "Encyclopidia worked really well for me" (March 7) and Tim thought, "The Books worked really well for me beacause I found more on space crafts" (March 7). May wrote in her journal:

Today I found lots of information I need, I actually found more information than I needed. Today I was successfull at finding information because I knew I really needed to finish finding information. (March 7)

George wrote:

Today I was successful at looking up Information on Saturn because I was not talking and I looked in lots of Book, in the L.V.D and in the C.D ROM. Reference worked relly well for me. (March 7)

Terry wrote, "I'm getting a good start on my research" (March 5) and Tammy stated, "I was really sucksesfull because I found lots of information on Mars" (March 5). During story writing Tim wrote, "I am getting lots of ideas that I can make fit in my story" (March 12). Students wrote about successes in the journals as they evaluated themselves and they also showed that they were aware of successes on an evaluation page when they evaluated their stories.

Awareness of Others

In my field notes I commented on how closely students monitored what others were doing. One student criticized another for copying information directly from a book. Trevor waited for another student before he would proceed with what he needed to do. Students monitored the numbers of students at the centers and, when one left, another student sat in their place. Alice offered to share her space suit information with Ben who was having difficulty finding any. Students were aware of who had an information source of interest to them. Students watched each other at the CD-ROM stations and gave suggestions about how to find particular information. The grade fives were aware of with whom they wanted to sit and work. They were

also aware of the teachers' presence and sought assistance when teachers were present. Throughout the study the students were conscious of others.

Planning

Planning occurred throughout the research project. In one instance, students planned their stories using a story map (see Appendix E). Here, they determined the characters, setting, conflict and resolution for their stories. They also listed some events that they planned to incorporate into their stories.

The grade fives were able to plan the characters and settings easily but some students had difficulty relating the story conflict and resolution in their plan. After teacher guidance, these problems were remedied. These plans served as blueprints for the writing of each story. After this initial planning experience, students were required to produce a sequence of events for their story, incorporating the story elements they outlined on their story maps.

Planning was also evident when students generated their research questions and topics before the library sessions. This required students to review their story plans and assess what information about space would be needed. Most of the grade fives selected a planet or the moon as topics to research along with a variety of other topics including spacecraft, space travel, suits worn by astronauts, and stars. These planning webs for information retrieval served as springboards for the library research process.

Not all of the students used these webs during every information retrieval session. Shawn told me he used a scrap of paper one time and then lost it. A couple of students did not use a web until the second library session. However, the majority of students did use a planning format to gather the information they needed from the library.

During a class discussion, a couple of grade fives mentioned planning in their mind before working on their stories one day. Marcy said she thought of a way to

shorten her story by putting something different in it. Terry also planned a way to shorten her story.

During an interview with Ben, he told me that planning was helpful to him when he was doing his research. He liked planning where to go in the library to get information. Ben said he did a lot of planning when he wrote his story: "I just had tons of stuff so I had to plan where they go and everything."

George and Tim also thought planning was one metacognitive strategy that helped them. George thought planning "helped me write my story better; like I planned so could plan where to put stuff, like my problem." He told me that if he had not planned in his thinking journal before going to the library, he would not have gathered as much information. George thought planning ensured that he would go to a station with information about his topic. Tim thought it was helpful to write down what he planned to do and then do it. Did planning help to keep Tim focused?

Elizabeth wrote in her journal that using a thinking journal was not helpful to her; she did not follow any of the plans, and it "screwed" her up. I asked Elizabeth to explain these comments during our interview at the conclusion of the study:

Well, all the plans that I wrote down, I kind of got mixed up and I couldn't follow them because all the other people would get to those . . . to all those things that I had in my plan first and I went somewhere else.

Elizabeth was referring to her plans outlining the centers in the library where she intended to go. If the centers in her plan were occupied with too many students, Elizabeth was unable to carry out the plan in her thinking journal. She seemed frustrated when her plans changed. For Elizabeth, her plans were not flexible; they represented something that needed to be adhered to exactly.

When students reflected on their experience of keeping a thinking journal, some wrote that planning was a valuable process for them. Kari thought that it was valuable to "plan my day and how I was going to do it" (March 19). Alice said it helped her to "not be confused" (March 19). Tammy thought writing about what she would do and then doing it was helpful to her.

Students' planning was also evident in my observations. Although students may not have formally written or spoken of plans, the fact that they equipped themselves with appropriate materials, carried out tasks in a systematic manner, worked diligently on tasks, and achieved sub-goals and goals led me to believe that planning was taking place. Organization of materials and time was evident. Students set goals to accomplish and planned the necessary procedures to meet those goals. There must have been some planning taking place in the minds of these grade five students as they carried out their research and story writing activities.

Evidence of planning was prevalent in the students' thinking journals. Frequency of statements exhibiting planning varied between the students. As shown in Table 3, the number of planning statements was less than awareness and self-evaluation statements, but greater than statements demonstrating self-regulation.

Planning and awareness were the first metacognitive aspects that were addressed with students at the beginning of the unit plan. Students used their thinking journals to plan activities in the classroom and the library in order to create their science fiction stories.

Amy wrote a detailed plan before going to the library to retrieve information. This particular journal entry was written in response to sentence stems that we provided for assistance (see Appendix D):

Today I'm going to go to the reference center. I'm going to look up on a book or books about a space station. I'm going to look at a book while sitting at one of the tables and I will be taking notes also. I will stay at that center for about 20 min, then after I will be going to the O.P.A.C. The materials I will be using are books, a pencil and paper. (March 5)

Amy's statements exhibited planning for where she intended to look for information, what she would do at a center, an amount of time to spend on this endeavor and the materials required to get the job done. Throughout her journal entry, Amy set sub-goals for herself and organized her library time to achieve the sub-goals.

Students' plans were detailed at times and at other times more general as illustrated in the following:

Today I am going to finish my story and start self-editing it. (Kari, March 12)

My plans for today is that il'l try to write as much as I can so I don't waste time. (Adam, March 12)

I will be now looking up Pluto. (Brian, March 5)

Today when I get to the library I want to go to the CD-ROM to find information on Venus or I want to go to the reference. (George, March 5)

In the Research Framework the criteria I outlined as evidence of students' planning included estimating time requirements, organizing materials, scheduling procedures or the steps necessary to complete an activity, and goal-setting. Each of these elements of planning was exhibited in the students' thinking journals.

Planning for Time

There were a variety of planning statements that addressed elements of time. Some of the students' comments were detailed and specified a number of minutes they might spend doing something. May's account of what she intended to do in the library is one example of this: "I will probably take 10 min. on the CD rom, 5 min. on the LVD, 5 min on the OPAC and 5 to 10 min. on the reference" (March 5). May predicted an exact amount of time she planned to spend at each center during this one particular visit to the library.

Tammy also planned within her time frame: "Today when I arrive at the libery I am going to try to look at the books and see if there are any other books I could look at and find where they are on the OPAC. I'm estimating the all this will take at least a hafe an hour" (March 5). Marcy also estimated time in her plan when she wrote "I will take 15 minits on the c-d-rom and the rest of the time I will do research in the space books" (March 5). Other planning statements referring to time elements were less specific:

One resource I want to use is L. V. D. because It is quick and easy and I'll have time to do others. (Terry, February 28)

One resource I want to use is World Book because it's faster to find stuff about space. (Connie, February 28)

I know that today I got my mind set on a book I want to read on pluto. I think it will take most of the time. (James, March 5)

Karen's thinking journal had the highest frequency of planning statements of all the students. In several places throughout her journal she referred to time elements in her planning:

first I'm going to go to the reference. I'll stay there for 15 minutes. Then I'll go to the lvd. (March 5)

I will write my story on Monday because we won't come back to do research. (March 7)

I hope that by the end of today I can finish my story. (March 13)

Karen was very conscious of time as she worked on her project.

Planning for Materials

Students wrote many statements in their journals that referred to the centers where they would be searching for information. During one lesson I prompted students to state the material they would need in order to carry out the activity. May's response was typical of what the students wrote: "The materials I will need are a pencil, paper and Research folder" (March 5). If students were not prompted to state specific materials they needed for a task, their journal entries focused on the centers in the library they planned to go to for information retrieval. There was little mention of resources they intended to view.

Scheduling Procedures in Planning

Were students aware of the many steps that they needed to take to facilitate project completion? Students planned the steps they would follow in order to achieve a goal or sub-goals. Reagan outlined the procedures she intended to follow in her plan:

When I get to the library, I am going to go to the OPAC and get out a book on Mercury. Then I will go to the LVD and look at pictures in case our story has to have pictures. Then the CD ROM and then the encyclopedias. I hope to get alot of work done today! (Journal, March 4)

Karen planned for retrieving information during one of the library sessions:

Now I'm going to go to the cd-rom and look up on the sun, spaces ships and space suits. Then I hope that I can return to the refrence and look through a book that looked yesterday at. (Journal, March 5)

Alice planned for herself during the writing of her story when she said, "Today I hope to get some information on the space ship. After that I can do the three events in my story then finish my story" (Journal, March 13). Alice's steps were general, but she generated a schedule of events in order to achieve the goal of finishing her story.

Goal-setting in Planning

Goal-setting was another element of planning that was evident in the thinking journal entries. Students tended to focus more on sub-goals than on the major goal of completing a science fiction story. Perhaps this allowed students to tackle tasks that were immediate to the situation and that appeared to be manageable.

Goal-setting involved setting purposes for activities such as information retrieval. For example, Elizabeth planned to go to the CD-ROM to "find some stuff on the great red spot on Jupiter" (March 5). Kari's goal one day was to "find everything I can about the moon in the period of time that we have" (March 5). Alice stated, "Today I plan to study Saturn, the space ship, comets and medioroids. All that stuff will be in my science fiction story" (March 5). In this example Alice indicated her sub-goals--topics of information for her story--as well as the bigger goal of including this information in her science fiction story. Some of the goals involved accomplishing a task or a prescribed amount of work:

I want to get into the middle part of my story. (Reagan, March 12))

My goal is to get all my research done today. (Shawn, March 5)

Today I plan to get my rofe copy done. (Shawn, March 12)

My goal is to get most of the research I need. (Aaron, March 5)

When we go back to the library I am going to finish my web and read all the stuff I need. (Trevor, March 5)

Goal-setting also involved writing about the actions students would take as a means to achieve a bigger goal. Kathy wrote, "While I am at each center I will write down little notes and good information" (March 5). In this way the actions became a means that would lead to the achievement of a larger goal.

Self-Evaluation

Self-evaluation was an aspect of the metacognitive process that appeared throughout the data. Evidence of self-evaluation was prevalent in the students' journals, and self-evaluative statements were more frequent than statements demonstrating planning and self-regulation.

Reflection and Self-Evaluation

Self-reflection seemed to be a big part of the self-evaluation process. Students had to reflect on past thinking and actions and then assess the productiveness of their thinking and actions. Reflection was illustrated in one of Trevor's journal entries after working on his story:

last time, we looked at introductory sentences and we started our stories. I got almost a whole page done and I think I'm doing good. (March 12)

Trevor remembered and reflected on what he did in the previous lesson and then evaluated his progress. Terry similarly reflected on what she did during one lesson and then proceeded to evaluate her progress:

When we went to the library I went to the reference and L.V.D. It went really well I got a whole bunch of info. from the word book in print. I'm getting a good start on my research. (Journal, March 5)

Jenelle reflected on her experiences with information retrieval and also evaluated the productiveness of this experience and thought about why she was successful:

Today I was successful at finding information in the reference section because books have lots of information. The Reference books worked for me. I think the reason for me finding lots of information was because I worked hard and

found lots of information and I'm glad I came to school because I wouldn't of found any Information. (Journal, March 7)

When students talked about other research experiences in the questionnaires that were administered on February 21, reflection occurred as they evaluated what they had done. Students were asked questions about writing reports. They were asked about what they did to start their report, what they did in the middle, and how they finished. They were also asked to describe their feelings during each of these stages. May wrote, "I got started by researching with friends to find the information we needed. At that point, I had a feeling it would be fun to write a report on something I've never really studied before." Amy had to reflect on how her group finished a pamphlet when she stated, "When we finished up we felt good cause we looked over all we did, all the writing the drawing pictures and more and we felt we did good."

One question on the questionnaire asked students what worked well for them during a previous research project. Karen reflected on her research experience and said, "The maps of Canada worked well. Because I had no trouble drawing the map and writing the provinces and the cities." Amy responded, "At first we didn't like our group but after we cooperated better also when we did our presentation, it worked great. No one messed up." Reflection on past experience and on self were prerequisites to self-evaluation.

Acknowledging Progress in Self-Evaluation

A number of statements in the students' journals evaluated their progress. James evaluated his progress when he said, "I was have troble starting but now I am working good" (March 5). Students used statements that qualified the amount of work completed:

Yesterday I rote more than a paragraph I rote one side of a page and haf of the other side. Yesterday things went great for me. (Connie, March 12)

I think it went well last day. I fineshed a page and some. (Stewart, March 12)

Yesterday I writ alot a page and a half on my story. (Shawn, March 12)

I got almost a whole page done and I think I'm doing good. (Trevor, March 12)

Yesterday I did write another two pages. I am almost done. (Tammy, March 13)

It seemed to be important to the grade fives that they measure the amount of work accomplished. Did this serve a competitive function among the students, was it intrinsically reinforcing to each individual, or did they think it was necessary to let me know what they had accomplished?

Elizabeth wrote about where she was in her work when she said, "Now I'm just about finished my story" (March 13). Tim said, "I am about in the middle of my story" and Amy thought she was doing "good in my story. I'm done writting it and I'm on my self editing stage" (March 13). These students demonstrated that they knew where they were in the storywriting process.

Evaluating Readiness to Proceed with Steps

Some of the statements in the students' journals showed evidence of students referring back to original purposes and goals to monitor their progress. Marcy monitored her progress when she said, "I am ready to research because I have completed my story map" (February 28). James similarly indicated, "I'm ready to start my research because. I've got my question ready" (February 28).

In some of the journal statements students assessed how ready they were to proceed in the research and storywriting processes:

I am ready to start doing research for my story because I know How to use all the resorses I need no. (Trevor, February 28)

I am not ready to begin because I do not have all my information. (Shawn, February 28)

Today I was successful at getting some information because I don't need any more information. I feel that I'm ready to start my science fiction story. (Elizabeth, March 7)

These statements seemed to guide students to the steps they needed to take in order to move ahead in their learning processes.

Evaluating Effectiveness of Behavior

Students wrote in their journals about on-task behavior. They seemed to recognize what constituted appropriate, on-task behavior. Terry wrote that she was successful at her research because "I worked my hardest and I had no interruptions and I was always on task" (March 7). Aaron and Shawn also wrote about why they experienced success:

I think the reason for me to be so successful is because I didn't talk to anybody.
(Shawn, March 7)

I think I did really well because I wasn't interrupted at all it also was fun.
(Aaron, March 12)

George wrote about one lesson when he was not on task. This journal entry was the day after one library session when he was neither prepared nor productive during information retrieval:

Now I know that you could not foul around and that you have to work and not talk to other people. I think that I made a big difference from yesterday. Because I was fouling around too much and I didn't get anything done. so I thought I had to catch up on my work so I can get more work done. Yesterday I was not doing my work because I was too busy talking to other people . . . (George, March 5)

George was aware of what he had done the day before and after reflecting on his behavior he realized that he needed to do something differently if he wanted to accomplish anything.

Evaluating Successful Experiences

Students also reflected on their actions and thinking, assessed productiveness and wrote about successes. Many students wrote about success during the information retrieval stage in the library:

Today I found lots of stuff in the library on the moon like what it looked like, how big it was and four explanations of how it was formed. (Kari, March 5)

I was successful at finding information on the space suit but I wasn't finished.
(Alice, March 7)

Today I was successful at the resorse aria because I found lot's of information . . . The reason I'm always at the books is because I always get alot of information reading the books . . . And again today my friends helped me. But Jenelle helped me the most because I was working with her. (Tammy, March 7)

Today I was successful at looking up information on pluto. I worked in the reference books, CD-Rom, Space books and L.V.D. . . . Also Today I got lot's of information I did not need. (Stewart, March 7)

Today I was successful at doing research on the spaceship and on space. The book Spacecraft and the video Stars and Constallations worked really well for me. (Kathy, March 7)

Students also wrote about successful experiences while writing their stories.

On March 12 we asked the grade fives to reflect on what they had done the previous day and evaluate how things went. The following excerpts were some of their responses:

Yesterday I wrote some of my story. It went very well . . . I am getting lots of ideas that I can make fit in my story. (Tim)

Yesterday, I wrote some of my story, and I though about Apollo 13 and I though of what I'd do if I was going to Mercury. (Reagan)

I was successful at writing the begining of my story but I'm not finished. I think my story will be the best one Ive ever written in my life. I think it is going to be the best because I have good plans for the story and good ideas. (Kathy)

Last day I did not have a plan so I just write my story but that what I want to do. Yesterday every thing went well I got a lot of work done. (James)

During an audiotaped discussion on March 13, one group of students indicated that writing their story went well for them because they knew what they wanted to write before they wrote. Someone in the group used the term "planning" to describe this. This group agreed that they liked writing their stories the most. They also said they enjoyed researching information in the library and found that this part of the

process worked well. The process of self-evaluation enabled these students to carry on this discussion.

Evaluating Unsuccessful Experiences

At times the grade five students reported a lack of success. Kari was disappointed because she was not able to find as much information as she thought she would. In many instances when students mentioned a lack of success they provided an explanation or possible reason why they were unsuccessful:

I was not able to finish my task because I couldn't find my story map. (Shawn, March 4)

My research didn't go so well. I hardly got any information in the books. I didn't get any information on the LVD. (Mary, March 5)

When I was at the libery it waint what I expected. Ther was so lettle time and I dint get lost of notes. (Rhonda, March 5)

I think the reason for me not finding tons of information is because I was looking in the wrong encyclopedia. (Ben, March 7)

Today I was not successful at finding information on space station's because I couldn't find the information. (Aaron, March 7)

On the movie, there was no information I needed for my book because I needed information on the moon and space crafts. (May, March 7)

I was not successful at finding information on the space ship because other people had the resouces I needed. (Alice, March 7)

Also today I was not successful at finding information in the movie. It didn't have any infor on the planets only on stars and I didn't need any infor on stars. (Amy, March 7)

These examples showed that students have assessed their situation and have generated reasons why they thought they were unsuccessful.

In audiotaped discussions on March 13, a group of students talked about problems starting their stories, having to shorten their stories, and the fact that they

did not use all of the information they got from the library. The grade fives were able to determine when they were unsuccessful through self-evaluation.

Evaluating Learning

In the thinking journals there were a number of entries that stated information or process skills that students thought they had "learned." I determined that when students used the word "learned" it signified that knowledge had been internalized and so I considered these statements to be self-evaluative. Some of these learning statements involved factual information:

now I know that there realiy is something call micrometeoroids. Now I no that garbig from a defrenet mesanh can reac your ship. (James, February 27)

Today I learned That Neptunes largest moon's is -390° F! And I also learned that Neptune has eight moons. (Connie, March 4)

I learned that the Planet Pluto was -220°C. It is the fardest planet from the sun. (Kathy, March 4)

Tammy was enthusiastic and eager to share what she was learning. Several of Tammy's journal entries included tidbits of information that she learned during the study:

Today I learned the difference between the personal Journal and the Thinking Journal. (February 22)

Today I learned how to use RAP. R - means read a little A - means ask questions and P - means put in key words or phrases. Thats what I learned. (February 27)

I also learned that Venus is the same size as Earth. (February 28)

It was fun. I learned that Mars is -40° C. (March 4)

Today I learned that Mars is red and orange. (March 5)

Students evaluated what they learned about skills that were part of the processes in which they were involved. Some of these entries were general and others were quite specific:

Today I learned That a thinking journal is when you write perdictions, plans, goals, expectaiton, and what your thinking. And what youve done our will do. (Aaron, February 22)

I think that what I learned about Journals will help me to write easier, and know the difference between a thinking Journal and a personal Journal. (Terry, February 26)

Today I learned how to get organized when I'm doing a researche project. I also learned how to pick good books for the research. (Kathy, February 27)

I learned today how to do long skinnies. All you have to do is cut a paper in half. I also learned how to do better research. (Reagan, February 27)

Today I learned wher I should look for info on my story wat are questions should be and are answers. (Richard, February 27)

Today I learned what kinds of things we should use for reacherche. (Alice, February 27)

The learning statements in the students' journals were reflective and evaluative.

Interviews with students also revealed that they thought they learned facts and skills. Terry said, "I learned that a thinking journal can really keep you organized and a story map before you're writing your story is helpful." When I asked George what he learned he replied emphatically, "I learned lots!" and then proceeded to tell me numerous facts. Tim thought he learned how to plan so "I would know what I'm going to do before I do it." Kathy learned "how to do better research" and "how to write better stories."

Evaluating Feelings

When I read and coded entries in students' journals during data analysis I realized that some of the students' statements not only assessed productiveness of their thinking and behavior but also described personal feelings about what they were doing. I considered these statements to be evidence of self-evaluation so I included them in this category. Connie enjoyed her experiences in the library and wrote "Today I can't waite to go to the Library" (March 4) and "I can't waite till Thursday to go

back to the library" (March 5). Terry's affective comments were evident throughout her journal:

I think that what I learned will help me to get a better idea of what information I need to know when I go to the library. I feel more secure about going there now. (February 27)

I feel great because I am doing pretty well up to this point (March 4)

I can't wait until I have all my Info. and I'm ready to write my science fiction story. I love this subject. (March 5)

I worked well I am proud. (March 7)

Yesterday I thought was a fun day we started our story!!! (March 12)

I think I still need some information then I'll feel more secure. (March 13)

Kathy and Amy were other students who wrote about the feelings they experienced. After information retrieval in the library Kathy wrote, "I really enjoyed the work and the research that we've done at the library" (March 7). While writing her story Kathy commented, "Today, I think I will enjoy writing the rest of my story, because I like what I've done so far. I have good thoughts about what I'm writing" (March 13). Amy wrote after one lesson, "This activity has been fun. I've learned new things at the same time I was having fun" (February 22).

Students' comments about their feelings were also evident in the interviews at the end of the study. Ben talked about being nervous during information sharing and when I asked him if there was anything else he would like to tell me he said, "I really liked this project and it was really fun to write a science fiction story" (March 20).

Evaluating Self and Process

Self-evaluation was evident in the thinking journal entries for March 19. This was the day that I requested that students evaluate the research and the storywriting processes--what was easy and what was difficult for them. This task demanded reflection and a certain amount of awareness on the part of the students. They had to reflect on their experiences, be aware of difficulties and aware of what was easy,

assess circumstances surrounding these, and weave these components into a self-evaluation.

Amy gave an elaborate account of her experience with the research process:

The research project was a good success for me. There really wasn't that many downfalls, except maybe I had a little trouble with finding information on a space station. But on the other hand the easy part was finding information on Saturn. Finding information on a Space station was pretty unsuccessful because there was that many books on space stations, and I forgot to look on the C. D. Rom for information. But finding either information was easy because there were lots' on the C. D. Rom, L.V.D and in the books about Saturn.

Margaret wrote about processing the information she had acquired and the experience of incorporating factual information into a story for the first time:

What difficult for me while I was doing my research was that I didn't know whether I would use something or not use something. And what was easy for me was gathering all the information on the stuff that I needed for my story. When I was doing my research sometimes I thought that it was hard cause whenever I do a story it is just like a normal story but this time my science fiction story, I thought it was going to be a challenge.

Some students thought finding the information they needed was easy. Students thought that using encyclopedias on CD-ROM stations, books in the reference center, and space books was helpful to them:

But the easy part was when I worked on the computer because I just have to print a word in and then all the information I need will pop up on the screen. (Rhonda)

Research in the library was easy in some centers. CD-Rom was easy. Space Books were easy also. (Stewart)

The thing that was easy for me was finding the information. Because most of the information I found was on CD-ROM. (Ben)

The research was easy for me because most of the centers I went to were useful. The most useful resource I went to was the space books. (Connie)

The grade fives also wrote about difficulties in their journals. Karen and George wrote that the LVD center was difficult to use "because it had no words or sentences to explain the picture" (Karen) and "because you really had to look hard"

(George). John expressed difficulty getting his research done because "I really want to get to work on my story."

During an interview with Ben at the end of the study he told me that information sharing was the most difficult part of the research process for him "Cause I was really nervous and I didn't really want to share my story but I did" (March 20).

Students evaluated their experiences with writing their science fiction stories. For the most part, students wrote statements that expressed self-confidence and enjoyment during this part of the process:

The easy part for me was to write my story because I knew what my story was about and I like to write story most of the time. (James)

The thing that was easy for me was writing my story. because I had lots of information. (Kathy)

It was hard for me to keep my story short because I kept getting more ideas. It was easy for me to keep writing my story because ideas kept popping into my head. (Trevor)

Before I started this project for research, I had a good idea on what I was going to research on. And that was the same for my story. I thought about what I was going to write before I wrote it. It wasn't that difficult at all, to put it in a easy way it was successful. (Amy)

I thought that the starting was easy for me because I have to do startings like introducing all my characters. And they were all going to go. I think it's easy because you have all these ideas that you're eager to put in your story. (Reagan)

Everything was easy for me because I had tons of ideas packed in my head. (Sam)

I know how to correct and edit it because I did lots of stories before. (Kari)

Well it took a very long time to elaborate and write. But it was my best work. (Rhonda)

When students wrote about difficulties with the storywriting segment of the unit plan, the most common problems involved limiting the length of the stories and using the information students had acquired:

The only thing that was hard was we had limits on our story. Another problem is that I got too much idea's and it wouldn't make sense with my story.
(Stewart)

My thinking was hard because I didn't know if I should cut the long sentence out of my story but I did and some was easy because I had to think about what to put in my story but all of a sudden they all just kept coming in. (Jenelle)

It was hard for me to keep my story short because I kept getting more ideas.
(Trevor)

During my story writing I had some difficulty at limiting pages. (Marcy)

One student's comment stood out as being different from all of the others. Terry expressed a difficulty that related to her feelings as well as the actual progress of her story:

One thing that was difficult for me was that I felt that my story wasn't good enough because I read other people's story's and I got kind a jealous, my story wasn't as good as their's except I made it better.

Terry evaluated her work by comparing it to the work of other students and then revised her story in an effort to improve it.

When I reviewed the interviews I had with students at the end of the study, I realized that some students did not acknowledge self-evaluation as being a process that was helpful to them. These perceptions contradicted the frequency of self-evaluative statements in the students' journals!

Tim, George, Terry and Ben did not talk or write about self-evaluation as being a metacognitive aspect that was helpful to them. For example, during our interview, I asked Ben to explain a comment in his journal about not finding any information on the video and having to work extra hard on "any center I get." He replied, "Because I had to work extra hard for the other day I didn't get any information from the video so I had to find extra information that I could use for that other day" (March 20). Was this not evidence of self-evaluation? Ben reflected on previous actions and then assessed his productiveness. He self-evaluated but seemed to be unaware that this process was helpful to him.

Elizabeth identified evaluation as being helpful to her. She found it easy to evaluate her story--Elizabeth talked about editing and considered this to be evaluation. When I asked her if she evaluated herself during the research process Elizabeth responded, "Well, I read how much information I got. I couldn't get enough on this . . . on my web . . . I'd go to another spot" (March 20). Elizabeth monitored the information she gathered and if she had sufficient information on a topic she would move to another topic on her web.

Kathy said that she used evaluation and "it helped me evaluate if I did good work or bad, if I was really working good or not" (March 20). Megan also told me that self-evaluation was helpful "To see how good I think I did." (March 20). Terry recalled doing an evaluation of her story. She was peer editing with Elizabeth and "she said like I should evaluate it more. And so I did and I changed some parts when I was evaluating it" (March 20).

Recognizing the Need to Alter Behavior or Thinking

Statements in the journals also showed that through self-evaluation the grade fives recognized the need to alter their behavior or thinking. Marcy recognized the need to alter her behavior when she concluded, "I think the reason I didn't find information on other things was because I took too much time on other questoins" (March 7). In other words, Marcy had a wealth of information on some topics but little information on the other topics she needed for her story. She attributed this to devoting an unequal amount of time for each of the topics. Here she implied that she was aware of what she did in order for this to happen and the reader is left with a feeling that next time Marcy might do things differently. The following student journal excerpts provide evidence that the grade fives recognized the need to alter their behavior or thinking:

I am not ready to write my story yet becuae I haven't done any reasearch. I am ready to start reasearchin because I know what I need to research. (Kari, February 28)

I am ready to use the resources but not ready to start my story cause I feel I need to do more research on my planet ect. (Amy, February 28)

In order to achieve my goal I need to work hard. (Shawn, March 5)

Next time I will work off my other stuff instead of my two planets because I got inuff information on my two planets. I need to get working on my stuff so I can get information on it so that I could have more information for my story. (George, March 7)

In an interview, Marcy talked about recognizing a need to change what she was doing because "when I was doing my research and I didn't have enough facts about Mars, I told myself in my mind that I would have to go get some more" (March 20). After reviewing these statements, it was difficult to determine whether they exemplified self-evaluation, self-regulation or both. Were these examples of students regulating their own thinking?

Self-Regulation

Self-regulation is a metacognitive aspect that was not as prevalent in the data as some of the other aspects. The frequency of self-regulatory statements in students' journals was less than awareness, planning and self-evaluation (see Table 3). I looked for evidence of two types of self-regulation: adjusting thinking and adjusting behavior.

I extracted examples of students regulating their own thinking from all the data sources. I looked for examples in the data where students governed their thoughts and showed an intent to proceed with an action.

I also observed students' behavior that demonstrated self-regulation--adjusting behavior to achieve a goal. I referred to students' comments and journal entries in order to determine if some alteration in behavior had taken place. I discovered that examples of self-regulation of thinking and self-regulation of behavior involved students changing their plans, their choice of resources in the library, their research topics, their stories and even their own conduct.

Adjusting Thinking to Achieve Goals

Although a few examples occurred in other data sources, more of the evidence of students regulating their thinking came from the students' journals. Connie wrote in her journal about having to change her plan one afternoon "because there are two many people at the video center instead I will go to the reference center" (March 5). Stewart planned "Next Time I will try to Find more information on Pluto" (March 7). Tammy realized that she was mostly using books for her information so she wrote "So instead of books I'm going to go to the LVD or the CD-Rom" (March 7). These statements illustrated how students regulated their thinking to suit their needs. When their plans changed, alternate plans were initiated via their thinking.

Students monitored the productiveness of research strategies and resources and regulated their thinking to select the strategies and resources that would be beneficial to them. Stewart was not able to find the information he wanted about Pluto on the CD-ROM so he talked about looking in the books (Class discussion, March 4). The following journal excerpts provided evidence of students altering their thinking to accommodate research strategies and resources that would help achieve sub-goals and goals:

Today I'm going to first go to the CD rom second I'm going to the L.V.D because I lost my information because it was just on a scrape piece of paper and today I'm going to use a web. (Margaret, March 5)

When I was at the library I didn't get much information that I need. Now I am going to Lvd or finding books. (Aaron, March 5)

Next time I will try to do something different because I am mostly reading books. (Tammy, March 7)

I will try to find more information then today so that I can write my story Next time I will use the CD-Rom. (Jenelle, March 7)

Next time I'll try to use the CD rom again to find more information about Neptune and Triton. (Connie, March 7)

Next time I will use refries aigen. (James, March 7)

I need to get more Info on other things I need. (Tim, March 7)

I need to get more info on how far apart Saturn and neptune are. (Shawn, March 12)

Terry thought about a strategy for processing the information she gathered. She decided that "I will devide my Info. into the stuff I really need because I think I have a bit more than I need" (Journal, March 7). Terry regulated her thinking to ensure success when she dealt with the mass of information she had acquired.

There was evidence of students thinking about changing the topics for the information they needed for their stories. Alice said that she changed her planet after discovering that Saturn had little land for her space shuttle to land on (Field Notes, March 4). During a class discussion Elizabeth indicated that she found out that there were other moons in the solar system besides Earth's moon so she decided to look for information on a planet instead. The following journal excerpts were examples of students altering their thinking about researching for information:

Yesterday I decided to change my planet. Now I'm going to work on Jupiter. (Elizabeth, March 5)

Next time I well work off my other stuff instead of my two planets because I got inuff information on my two planets. (George, March 7)

I need to work on the clothes that the astronauts where, so that I can write about the clothes in my story. (Kathy, March 7)

I'm going to get losts of information on space suits and the space shuttle. The most important one is the space shuttle because thats where most of my story takes place. (Alice, March 12)

Students changed, added, and deleted topics if they experienced difficulty finding information, if they discovered they needed particular information for their stories, and if they could not manage their stories with topics chosen at the beginning of the project. The grade fives altered topics for research according to their needs.

The data revealed that sometimes students altered their thinking about writing their science fiction stories. During an interview, Terry told me that she realized her story needed more work but did not have time to make the changes. I asked her what improvements she had intended to make. She said, "More, putting more information

in my story" (March 20). May thought she was going to rewrite her story. She wrote, "After I heard everybody else's ideas, I knew I had to change mine" (Journal, March 13). Aaron told me he needed to know about a space station in order for him to determine the direction his story would take (Field Notes, March 12). Aaron thought about this while he was writing his story.

Some students were aware that their stories were going to be too long so they evaluated what they had written, changed their thinking, and then changed how they wrote their stories. Kari wrote about shortening her story and making it more interesting. She stated, "I had to change my thinking because some stuff just wouldn't work out for me" (Journal, March 19). Elizabeth wrote in her journal about planning to cut things out of her story and Connie thought about shortening her story and then writing some more (March 13). During a class discussion, Marcy and Terry said they thought of ways to shorten their stories (March 11). They were aware of needs for themselves and their stories and altered their thinking to meet those needs.

Some students were aware of their research and storywriting behavior and thought about how their behavior needed to change in order to achieve their goals. George reflected on his behavior and wrote about wasting his time talking with friends. He then stated, "I thought that I had to catch up on my work so I can get more work done" (March 5). George altered his thinking and redirected his behavior in order to successfully retrieve information for his story. Terry wrote, "Today I think I'm going to have to work hard because I've realized that I'm kinda behind" (March 13). After evaluating the amount of writing she had done one day, Terry regulated her thinking to initiate some changes in her actions so she would catch up to other students.

Adjusting Behavior to Achieve Goals

When I observed students, I saw evidence of self-regulating behavior. I watched the grade fives check a chart in the library to see which center they should visit. Margaret saw that there were too many students at the LVD center so she returned to that center later on. Students regulated their behavior when they halted

story production to return to the library for information. I also watched students change their story plans and shorten their stories. I noticed how diligently George worked in the library one day after a lesson where he had displayed little on-task behavior. It was evident that the grade five students adjusted their behavior to meet the demands of tasks and to achieve their goals.

During class discussions students said they had changed planets for their story setting because of difficulties finding the information they wanted. Terry said that she moved to another table when people she was sitting with became too talkative.

In the small discussion groups that I audiotaped, the grade fives discussed altering plans for stories and altering stories. One student talked about how she changed her title for her story because the one she chose had nothing to do with her story. Another student said, "I changed my thinking" and proceeded to talk about changing her story map from the original plan. Margaret recalled that at first she wanted "a whole bunch of details" but later limited the number of details in her story to keep it short. Someone else discovered that she was not using descriptive words in her story so she went back and added them in.

During a small group discussion, Ben was aware that he made a few changes and talked about them. He had too many characters in his story plan so he limited the number of characters before he wrote his story. He also realized that he forgot to put factual information in his story so he rewrote his story putting some information in it. Ben talked about using a different resource because the encyclopedia on CD-ROM was not working well for him.

The responses on the questionnaires showed that students had regulated their behavior during previous research projects. George recalled that his group could not get the information they wanted with the search terms they were using so the group used other terms to access the information. Stewart remembered having to rewrite the beginning of a grade four report three times because he was not satisfied.

The interview I had with Terry revealed that she regulated her behavior. Terry told me she changed her story to make it better:

Well I crossed out some parts that weren't needed and I made alot of details.
(March 20)

She said she went back to the library for information when she discovered she needed more, instead of continuing with her story. Terry also changed the planet she was going to land on in her story and she said that when she was evaluating her story with a friend she decided to change some of the vocabulary and then did. I asked Terry if she remembered regulating her thinking or changing something she did. She replied "No, not that much" (March 20). It became apparent to me that Terry was not aware of regulating her thinking or her behavior even though it was evident that she regulated both.

During an interview Ben talked about a comment he wrote in his journal about working extra hard one day to compensate for a previous lesson when he was not very successful getting information. This showed that he regulated his behavior during a class in order to achieve a goal he set for himself.

Elizabeth talked about reading over the amount of information she had and when she "couldn't get enough on this . . . on my web . . . I'd go to another spot." Elizabeth monitored how much information she gathered and changed topics for information retrieval accordingly.

The students' journals showed a few statements during the research project where students wrote about something they changed in their actions in an effort to maximize success. Tim wrote that he was having difficulty finding information on Mars and he "changed my planet to Saturn and it all became much easier for me" (March 19). Connie wrote that she "had to make another space on my web" (March 5). Amy wrote about having to adjust her plan while she was in the library:

I said I was going to research on a space station, but instead I did research on my planet Saturn, then I looked for information on a space shuttle. (March 5)

Amy gave no reason why her plan changed, but Margaret and Reagan gave reasons when they wrote about how their plans changed as illustrated in these examples:

In my plan I said I was going to go on the CD rom first but then I went on the OPAC first cause the L.V.D and the CD rom were full but after the OPAC I went on the L.V.D. with Elizabeth and Mary. (Margaret, March 5)

I wanted to work with the LVD, but I was looking for info. on Mars with my friend but I didn't find any on the CD ROM so we changed to Mercury. (Reagan, March 5)

The grade fives wrote about how they altered their behavior while they wrote their science fiction stories:

I changed a bit because I knew it had to be short story. (Terry, March 12)

Yesterday I asked Mrs. Roche if I could right chapter's in my story but she said no because it's only supposed to be a short story so I had to take some details that weren't important in my story because my story was three pages already and I didn't even get to my problem. (Margaret, March 13)

It was difficult for me to put all the stuff I put in my story. like, I wanted to make my Characters almost crash into the sun but it was too long so I took it out. (Reagan, March 19)

The students were aware of the prescribed story length and made necessary changes in order for their stories to fit within the parameters.

During an interview Marcy told me, "I learned how to use a thinking journal. I learned how to self-regulate myself." I asked her what she meant by this. Marcy replied, "Well, like self-regulate . . . like figuring space with my story so how much room I need to have. I think that's what it means" (March 20). Marcy was aware that she regulated herself.

The presentation of the data thus far has illuminated the process component of the project. The data collected revealed that students used metacognitive strategies as they engaged in the processes of library research and their own learning. The four main themes that emerged are metacognitive aspects that students used to govern their thinking and actions throughout the project. These metacognitive aspects give insight into the processes experienced by the students as they worked towards the final goal of writing a science fiction short story.

The Science Fiction Stories

As well as looking at process, it was important to examine the data and look at the final product in order to determine the extent to which the students included factual information in their stories. Before I read the students' stories, I was filled with apprehension. I had no idea how the grade fives had managed the task we gave them.

I read over the students' stories, searching for factual information. In order for me to determine what might be evidence of the incorporation of factual information, I reviewed the planning webs to see if a student's notes corresponded with information they wrote in their story. Sometimes the information was quite general:

When we were safely in space we took off our spacesuit, and started floating with no gravity all over the spaceship. (Terry)

We went through tons of galaxies and passed different planets with more than one moon. (Terry)

The moon looked dead, barren and airless. (May)

We could see the bright stars in the sky all around us. (May)

They are on the side of Mars where it is the warmest and that is the side that is facing the sun. (Jenelle)

Once they arrived on Jupitur they couldn't stay to long because it was getting to hot. (George)

Some of the information was more specific and detailed as illustrated in the following examples:

The sea of tranquillity is a big flat spot on the moon. The moon is about 4,600,000,000 years old! (Kari)

The way we are taking, will take one month 4,582,700,000 km. The temputure is -384°F and -233°C. Dress very warm!" said Brian. (Ben)

Hmmm! Oh! Saturn is the second biggest planet, Hmmm! Saturn takes about 29 1/2 earth years to go around the sun!! (Alice)

I almost jumped out of my socks because there were live humans on Saturn and Saturn was -178°C . (Amy)

One hour later it will take some amount of time to pass the first planet which is Mars so me, Brian and Teresa looked at books about Mars. (James)

Since the oldest stars are about 15 billion years old. (Karen)

I reminded myself that Mars had 95% of carbon dioxide. (Karen)

"Absolutely it is minus 40 on the side that is not facing the sun and the side that is facing the sun is minus 23" (Jenelle)

I also looked for vocabulary that may have resulted from students' library research. I considered any words that were technical in nature to be evidence of this vocabulary. Words and phrases like "command module," "air supply tubes," "earth years," "Cape Kanavral," "space station," "mid-deck," and "launch day" were examples I found in the stories.

After rereading the stories a number of times I realized that some of the grade five science fiction stories contained very little factual information. Eight stories had no evidence of factual information. This was disappointing for me. Vivian, Dawn and I had expected that students would have incorporated much more of the information that they had so busily and enthusiastically gathered in the library.

Why had students not used more factual information in their stories? I thought deeply about this question and pondered a few possibilities as to why this may have occurred. My thoughts come from years of experience as an elementary school teacher and from a review of the literature about children's writing and children's literature.

Lerner (1985) has discussed how science fiction was not always accepted in the classroom by its writers and readers. Before 1947 the educational community displayed hostility or indifference to science fiction and students concealed science fiction that they read from their teachers. Educational literature began to notice the existence of science fiction when science fiction books appeared in hard cover from trade publishers. It was not until the late 1970's that students read science fiction with

approval from their teachers, and the library profession familiarized themselves with modern science fiction and recognized it as an important genre of contemporary literature. Science fiction literature has since become increasingly popular.

Huck, Hepler, and Hickman (1993) have suggested that, in children's literature, the line has always been difficult to draw between fantasy and science fiction. Some critics have made the distinction that fantasy presents a world that is not possible, but science fiction speculates on a world that might one day be possible, given what we know about science. Children are likely to label any book that includes "the paraphernalia of science" (p. 435) as science fiction. Huck, Hepler and Hickman have suggested, "Many children come easily to science fiction by way of books that may not fit a purist's definition of the genre but which incorporate some of its trappings such as robots, spaceships, futuristic settings or scientific terminology" (p. 436). With this in mind, the grade five students may not have had much experience reading science fiction literature that included scientific information. Although a science fiction novel had been read to students and they had been introduced to elements of the science fiction genre before the project, their experience with this genre may have been limited. Students would more likely be familiar with science fiction through full length novels, through film, video and television, and through computer games. Few of the students would have been familiar with science fiction in short story form. Perhaps more experience with this kind of science fiction literature would have produced different results in the students' stories.

Throughout most of their elementary school years students seem to have more experience with expressive and creative writing tasks than with expository writing tasks. Students become more experienced in expository writing as they reach the higher elementary grades because they have more opportunities for this kind of writing. The assignment we gave the grade fives was not expository writing, but creative writing based on factual information. Was their lack of experience with this writing task a factor that limited the amount of information they incorporated into their stories?

Hayes and Flower (1980) have proposed that writing consists of three major processes which are under the control of an executive monitor--planning, translating and reviewing. In this model, a complex intermixing of these phases takes place. In other words, the phases are recursive.

Flower and Hayes (1980) have stated that "As a dynamic process, writing is the act of dealing with an excessive number of simultaneous demands or constraints" (p. 33). They contend that constraints affect what people write and how they carry out writing tasks. Flower and Hayes have also stated that, in expository writing, knowledge may be considered a constraint on the writing process when it is not in an "acceptable form." This may occur when "incoherent thought and loosely related pockets of information" need to be transformed into "a highly conceptualized and precisely related knowledge network" (Flower & Hayes, 1980, p. 34). These grade five students were expected to transform bits and pieces of factual information and the story elements into a science fiction short story. Was the information the students retrieved a constraint because it needed to be creatively woven into their stories?

Marzano (1991) pointed out, from the perspective of Flower's and Hayes' model, that "writing is one of the most taxing of cognitive acts because it maximizes the load of information that must be maintained in working memory during its execution" (p. 563). Marzano referred to Johnson-Laird's (1983) "mental models" as mental programs with variables and suggested that the difficulty of the execution of a program depended on the number of variables. Marzano also discussed Anderson's production model of cognition (1983) where Anderson proposed that the more decisions involved in a cognitive act, the more difficult it was to execute.

Writing a short narrative and incorporating research information is a challenge. The execution of the grade fives' writing task was difficult because of the number of decisions or variables we were expecting students to process in order to successfully complete their science fiction stories. We wanted the grade fives to produce a science fiction story that included all the story elements of characters, setting, conflict, conflict resolution, as well as to tailor their stories to fit within set parameters--limits on numbers of characters, settings, and story length. We wanted a science fiction story

that could be clearly understood and that followed conventional rules for the mechanics of writing--syntax, spelling and punctuation. We also expected the students to incorporate factual information into their stories during the recursive phases of the writing process. This was a complex task for the grade fives and perhaps not a reasonable expectation for this class at this time.

I wondered whether or not grade five students could write science fiction stories including more factual information if given more opportunities to do so. I also wondered if we would have had different results if students would have gone through their stories and physically underlined the facts and vocabulary they had incorporated. This procedure might have alerted those students who had no information in their stories.

The students were able to evaluate their own work. When the grade fives filled out their evaluations of their stories, responses to a question asking how well they incorporated factual information showed that some students were aware that they included only a little information. Connie wrote, "I only included a little bit of factual information." Amy wrote that she did not think she used enough information in her story. Rhonda wrote, "not too well"; she had no information in her story. Marcy wrote, "I didn't really include that much information" but she included none. Trevor's response was "not very well." He included two facts, one of which was discussed in class before the library research began.

Other students were aware that they did incorporate factual information and expressed satisfaction with what they produced. Terry wrote, "I did well in that part I added a lot of factual info." Her story included more information than the stories of most of the other students. Students seemed to be cognizant of how well they included factual information in their stories.

Summary of Metacognitive and Library Research Processes

During this research project, it was evident that the metacognitive process and the library research process were two simultaneous and interrelated processes.

Students' engagement in both processes seemed to influence how the final product was completed. For instance, those students who were highly cognizant of their mental processes--those students who were aware, who planned, who assessed their progress and evaluated themselves and then regulated their behavior according to these aspects--were most successful in completing stories that fell within the parameters and in fulfilling the requirements that had been set out for them. How students engaged in the processes also determined the kinds of experiences they had. Successful experiences depended on regulating thoughts and behavior according to need and on directing energies to produce successful results. Although all of the students produced a story, there seemed to be a strong link between students' engagement in processes and the successful completion of the product--the science fiction stories.

CHAPTER SIX

Interpretation of Data and Discussion

Metacognitive Aspects

The data revealed that the grade fives were able to use the metacognitive strategies that had been taught as part of the unit plan. Most of the students found using metacognitive strategies for this project to be helpful. Many students indicated in their journals or during interviews with me that awareness, planning or self-evaluation were valuable processes that they were aware of having used and that they would find useful for future library research projects. Self-regulation was one metacognitive aspect that most students were not as aware of having used. This aspect was more difficult for the grade fives to comprehend. Perhaps more time devoted to developing awareness of this metacognitive aspect would have been beneficial to the students.

There was evidence that the metacognitive aspects--awareness, planning, self-evaluation and self-regulation--could not be confined to rigid categories. The categories had leaky boundaries. Awareness occurred during planning, self-evaluation and self-regulation. Self-regulation was evident when students evaluated themselves. Regulating one's own thinking and behavior often seemed to lead to more planning and self-evaluation. Self-evaluation and self-regulation seemed to influence the planning that took place for all of the students' activities. I noticed this when I read students' statements in the thinking journals. For example, it was necessary for students to assess and evaluate the information they had in order for them to plan for further information retrieval. Self-regulatory statements were often embedded in or followed by planning and self-evaluative statements. From this evidence, I suggest that there was an ongoing dynamic interplay between these aspects of the metacognitive process.

Reflection

Reflection was an integral part of the metacognitive aspects. Reflection also seemed to be a prerequisite to aspects like planning, self-evaluation and self-regulation. Planning demanded that students reflect on task requirements as well as on past experiences. In order for students to evaluate themselves it was necessary to reflect on past actions and experiences. Similarly, before students could regulate themselves, they had to reflect on past events and their behavior and recognize a need to regulate their thinking and behavior.

Awareness

Flavell (1979) discussed four classes of phenomena that are instrumental in metacognition: metacognitive knowledge, metacognitive experiences, goals and actions. Metacognitive knowledge includes knowledge of person, knowledge about a task, and knowledge about strategies that would be most effective in successfully completing a task. The data I acquired throughout the research project revealed that students were aware of and had knowledge about themselves, knowledge about tasks and knowledge about strategies.

Flavell (1979) stated that metacognitive knowledge "can lead you to select, evaluate, revise, and abandon cognitive tasks, goals, and strategies in light of their relationships with one another and with your own abilities and interests with respect to that enterprise" (p. 908). This was evident in how students chose resources, changed topics, planned for procedures, and revised their stories. Flavell also believed that metacognitive knowledge can lead to metacognitive experiences "concerning self, tasks, goals and strategies and can also help you interpret the meaning and behavioral implications of these metacognitive experiences" (p. 908). Awareness and reflection helped students interpret the meaning of their metacognitive experiences. Self-evaluation was also a process instrumental in interpreting the meaning and behavioral implications of students' metacognitive experiences.

Students' awareness, demonstrated throughout the project, relates to the knowledge phenomenon outlined by Flavell. Awareness seemed to be a prerequisite

process to other processes in metacognition. For example, in order for students to plan effectively they needed to be aware of themselves, and of the needs of tasks, as well as of task strategies and goals. The grade five students exhibited awareness of themselves, of knowledge, tasks and strategies, of their behavior and experiences, of their difficulties and successes, and of other people. Therefore, awareness had many facets.

I looked for a relationship between how students approached and completed tasks and the frequency of awareness statements in the students' journals. It was difficult to come up with a definite relationship. The amount of awareness exhibited differed between the students. James demonstrated a high degree of awareness about tasks and his own abilities when he wrote in his journal. Terry had a high frequency of awareness statements in her journal and her behavior showed evidence of awareness throughout the project. She was able to closely monitor herself and her experiences and take action according to what she monitored. Students who had a higher frequency of awareness statements in their journals seemed to be more conscious of themselves, their experiences, and the progress they were making.

One exception to this generalization was Stewart. Stewart showed a high frequency of awareness statements in his journal (see Table 3) but throughout the project he did not exhibit this same awareness. When students planned their science fiction stories, his lacked the elements that we had outlined. His information retrieval page had little information on it and his story contained no factual information. He seemed unaware of the goals of the project and what needed to be done in order to achieve them.

Planning

The most tangible metacognitive aspect, planning, involved students planning for time, planning for materials, scheduling procedures, and setting goals for themselves. Students relied on planning webs to help guide them through the library information retrieval process. The plans for their stories on story maps shaped what they wrote and assisted them with the composing process. Many grade fives

commented on how easily their ideas flowed while they wrote their stories. According to Flower and Hayes (1980), plans reduce "cognitive strain" during the writing process. The planning procedures used by the grade five students may have reduced some of the number of demands requiring conscious attention while they composed their stories.

Students' views about planning differed. Elizabeth did not see merit in writing down plans because when her plans changed she became frustrated. Shawn wrote that his thinking journal was not helpful to him because "all I did was writ in it to seat my goals" (Journal, March 19). Shawn did not see any value to writing down goals in a thinking journal. A number of other students thought planning was a metacognitive strategy that helped them. Terry and Kathy wrote in their journals that using a thinking journal to plan helped to keep them organized. Alice wrote that using a thinking journal helped her plan how her research would go in the library and "it helps me plan and I like it because it would help me not be confused" (Journal, March 19). Kari liked being able to plan her day and how she was going to do it (Journal, March 19). During the student interviews, Terry, Tim, Greg, Kathy, and Ben mentioned that planning was a metacognitive strategy that helped them.

All of the students were able to produce plans for what they intended to do. The amount of detail students included in their plans varied. During the students' research in the library, planning mostly involved planning which center to go to for information and mentioning topics for which information they wished to retrieve.

Planning did not always ensure that plans were followed. At times this was because of a need for plans to change--a center in the library had the maximum number of students, someone was unable to find information they wanted at a center, information retrieval notes were misplaced, or a story needed to be altered for some reason. It was amazing how flexible most of the students were about changing their plans.

A few students made plans but did not follow them. An example of this was on March 5 when Trevor and Sam wrote down plans for library research in their journals. I observed them in the library wandering about, appearing to be unfocussed.

Trevor had intended to "write all the important stuff down like what my planet looks like" (Journal, March 5) but he took no notes in the library. This particular lesson we devoted most of the afternoon to working in the library. Trevor had good intentions but he seemed to not be able to act on them. Trevor wrote in his journal, "My thinking journals was not that Helpfull because It was hard for me to do what I wrote" (March 19). Trevor was aware of the difficulty he experienced in carrying out his plans.

Self-evaluation

Self-evaluation was a process that, like awareness, had many facets. Students evaluated a number of phenomena that related to themselves. Students reflected on and then evaluated their progress, their readiness to proceed with tasks, their behavior, their learning and feelings, and their success or lack of success throughout the process of the project. There was a strong relationship between the frequency of awareness statements and the frequency of self-evaluation statements in the students' journals.

Self-evaluation was used a great deal by students throughout the project. Students seemed to be able to monitor how things were going for them and they did this regularly. This monitoring was done consciously because they used thinking journals. The thinking journals were tools to assist students with monitoring the processes in which they were engaged.

I found that I evaluated myself a great deal. This process was essential to my planning and decisions that were made concerning the project. My reflective journal was instrumental in sorting out my thoughts and assessing my progress and it was through these processes that needs to alter my own thinking or behavior became apparent. I believe that my own experience using my reflective journal was similar to that of the grade fives using their thinking journals.

There were differences in how well students were able to evaluate themselves. Some students were very thorough when they reflected on their experiences and assessed their progress. Other students were more limited in how they evaluated themselves.

One of the criteria I outlined as evidence for self-evaluation in the Research Framework was students asking questions of themselves. There was no evidence that the grade fives asked themselves questions during the research project. Perhaps they did but did not articulate the questions or write them down.

Self-regulation

After looking at self-regulation statements in the students' journals, I realized that many self-regulative statements followed self-evaluative statements. Self-evaluation seemed to be a prerequisite to self-regulation. It was necessary for students to self-evaluate in order to realize a need to alter their thinking or their actions. There were several instances where self-regulation statements were also coded as self-evaluative. There was an overlap between these metacognitive aspects.

The frequency of self-regulation statements in the students' journals was low compared with the frequency of statements showing awareness, planning and self-evaluation. However, I do not interpret this as evidence that students seldom regulated their own thinking and behavior. Although the grade fives did not often write about adjusting their thinking or behavior to achieve their goals, their actions throughout the project showed that they did regulate themselves. Students changed topics and story plans, they moved to different centers in order to retrieve desired information, they selected different resources, and they altered previous information when new or different information came to light. Students returned to the library for missing information and retrieved more information when they determined that there was a need. Students regulated their behavior and their attitudes. These examples are evidence that students were effective in carrying out self-regulation. There was evidence throughout this project that students were aware of needs to alter their thinking and behavior and that they were conscious of the changes that they made. How aware were students that they regulated themselves? Students did not appear to consciously think of these actions between awareness of need to make changes and the achievement of those changes as self-regulation.

Personal Reflections

My experience throughout this process has given me the opportunity to reflect on myself and my own experiences, to self-evaluate, to self-regulate, and to become more cognizant of my own mental processes. I found myself performing all the metacognitive aspects that I looked for in the students with whom I worked. At times when I was planning, evaluating myself and regulating myself, I was too busy to notice that I was engaged in these processes. It was only after the events when I took the time to reflect and write down my thoughts in my reflective journal that I understood how I, too, used metacognitive processes.

The evidence throughout the research project showed that metacognitive processes are extremely complex and that students differ in how they engage in the processes. Monitoring students throughout this project has given me the opportunity to understand that process experiences differ for students and that process experiences for some students evoke a deeper understanding of themselves. I believe that the grade fives who immersed themselves in their own metacognitive processes received a number of benefits. They experienced the benefit of consciously knowing themselves and knowing how they learned and they received the benefit of achieving goals and creating successful experiences for themselves, all of which facilitated personal enjoyment along the way.

I also acknowledge that at times we underestimate what children are capable of doing. The resourcefulness demonstrated by the grade five students and the insights that they gave in their musings exemplify the great capacity children have for acquiring and processing information. The students were expected to meet the demands of a complex research project and, for the most part, the grade fives were successful in doing this.

While I wrote about this research project and the metacognitive abilities of the students with whom I worked, I returned to the literature about metacognition many times. After rereading what other researchers had said about metacognition, I was disappointed that my findings and views were similar to those that had already been

written about. However, as I reread these same articles I realized that I had a much greater understanding about what the authors meant. Metacognition means more to me now. I have a greater understanding of Flavell's work and his model of metacognition. I have a greater appreciation for metacognition and the recommendations for teaching practice that other educators have espoused. It is through this kind of research that one gains a deeper understanding of that which the researcher seeks to illuminate.

Recommendations for Further Research

The teacher-researcher role that I adopted for this study worked well. I worked closely with the grade five students and we were able to get to know each other and to develop a rapport that would not have been otherwise possible. The students and I were comfortable with each other and the students responded enthusiastically, especially in their journal writing. The role of teacher has become a natural one for me and being teacher-researcher allowed me to collaborate with colleagues to create a "metacognitive unit plan" for a library research project and teach it as well as carry out research. The teacher-researcher role appealed to me because of the practical, educational nature of this kind of research. Burton (1991) has stated that the most powerful reason for carrying out teacher-researcher studies is "their potential for generating insider knowledge useful to educators in a manner that does not disrupt the classroom, but instead potentially enriches the quality of education that children receive" (p. 229). Because I was involved in teaching the unit, I think I was more attuned to the progress of the students and their needs. I was able to adjust lessons to guide the grade fives, to generate activities that would help them maximize their learning and that would also facilitate data collection for my research. Burton (1991) has suggested that teacher-researcher studies may help define a truly educational paradigm of research.

A teacher-researcher stance is not an easy one to take. There were a few lessons when I felt torn in different directions--torn between assisting a student and

madly writing field notes. I felt very much like I was "juggling a number of simultaneous constraints" (Flower & Hayes, 1982, p. 31). Perhaps feelings of inadequacy could be dispelled with more experience using research techniques and with more experience being a teacher-researcher. One tool that helped me was my reflective journal. At the end of a day, sketchy notes would trigger a flood of memories and occurrences and in this way I was able to fill in many blanks. Reflective journals are an effective way for teacher-researchers to use action and reflection reciprocally and thus guide future encounters with their students.

Triangulation was valuable to this study. The calculation of the frequency of certain statements in students' journals provided a quantitative element to an otherwise qualitative study. Although the students' journals provided the richest source of data, the questionnaires, my field notes and reflective journal, the student interviews, the student planning pages, the story evaluations, and the stories themselves all helped to give information about the grade fives and their metacognitive abilities. The main metacognitive aspects emerged in all of the data sources. The different data sources supported patterns that emerged and different facets of the metacognitive aspects became apparent. Contradictions in data were also evident when data was triangulated. For example, Stewart had a high frequency of awareness statements, but my observations of him indicated that he was less aware of the project goals than indicated by his journal statements. Also, George had a high frequency of self-evaluation statements in his journal, but during our interview he told me that he found it hard to evaluate himself and he did not identify self-evaluation as being a metacognitive aspect that was most helpful to him. These contradictions generated new questions in my mind and encouraged me to consider new perspectives.

The thinking journals were an effective way of tapping into students' minds and revealing their thoughts. They were also an effective means of helping students consciously monitor their own thoughts about everything that was happening to them as they participated in the library research process. Blakey and Spence (1990) and Loerke (1992) advocated using journals as a means of developing metacognition. Blakey and Spence have contended that when a journal is used in this way it becomes

a "diary of process" (p. 13). The grade fives' thinking journals were diaries of the processes students were engaged in as they participated in this library research project.

I find myself with many questions, evoked by my research. What happens in the metacognitive process of students who experience more difficulty than others when they carry out research endeavors? Although Trevor wrote plans for himself, he was unable to consistently carry them out. During one session he thought he was successful even though he had not achieved the goal of retrieving information in a way that was useful for him to write his story. Are these difficulties experienced by students an indication of a breakdown somewhere in metacognitive processing? If so, where? Self-regulation? Or self-evaluation? There is a need for further research to determine why some students have difficulty evaluating or regulating themselves. Perhaps further research in this area will lead to some valuable answers for teaching practice so that teachers will be able to intervene more effectively to assist students who flounder when approaching tasks and to encourage more independent learners.

This research was only one experience with one group of children and the findings cannot be generalized to a large population. There is a need to conduct research in this area with many students to paint a clearer picture of students' metacognitive processes during library research. There is also a need to work with students over a longer period of time to determine students' metacognitive abilities. Longitudinal studies where metacognitive strategies are taught, reinforced, and then where reinforcement is gradually decreased would show what students are able to do independently without teacher prompting.

Metacognitive research should be carried out with children of various ages. Are certain metacognitive aspects more teachable at certain stages of a child's development? Vygotsky's theory has proposed that learning leads development. This makes a strong case for teaching metacognitive strategies to children.

Implications for Teaching Practice

McGregor (1990) found that high school students tended to use intuition and not consciously think about their thinking while they gathered and used information to write research papers. McGregor also discovered that the students were not aware of ways to alter their thinking to be more productive. She stated that to these students "the process of thinking was a mystical, unexplainable phenomenon, one that had almost magical qualities" (p. 5). Therefore, in order for students to better understand their mental processes, intentional teaching about the mental processes involved and intentional teaching of metacognitive strategies would be beneficial. Teaching metacognition to children early in the school years may sow the seeds for a harvest of rewards in later years. Then, students would realize that their thinking is instrumental to success in library research and other learning tasks. Students would also realize that their thinking can be self-monitored and altered if a need to alter thinking arises.

At the end of the project, it was evident that a few of the students saw little value in keeping a thinking journal. They could not understand how their journal might have been of benefit to them. Reasons for their views ranged from the journal being of little use because it had no information in it that a student could use, to the journal infringing on the time students could have spent writing their stories.

However, most students did acknowledge value in their keeping a thinking journal. Some of the reasons included that it helped them to plan, it helped to keep them organized, it was a good way of keeping track of what they did, it helped keep their thoughts clear, and it helped them to focus on their projects and what they needed to do. From my perspective I think the thinking journals did all of these things and more. Students were also given the time and opportunity to connect with themselves and with how they learned and to consciously monitor the metacognitive processes in which they were involved. Pitts (1992) has stressed the need for personal reflection during research assignments and has advocated allowing time for students to do this. The thinking journals gave the grade fives the time and opportunity for personal reflection.

As I reflect on what we did with this grade five class, I have thought that in my own classroom I would start the school year off by introducing the students to a thinking journal. Over the years I have had my own students keep journals that are more diary-like, but I see great value in keeping a thinking journal. I visualize this tool as being a diary of process that may be used across the curriculum. That is to say that it may be helpful in any subject area but should not be overused. Throughout the school year I would move through the aspects of metacognition beginning with awareness and then planning. Later we would get into self-evaluation and self-regulation. Students would be taught specific "thinking" vocabulary and criteria for these aspects along with the strategies to develop these processes. This would be beneficial to any class of students.

Class discussions where students reflect on and then share their experiences is an important activity to encouraging metacognition in the classroom. Blakey and Spence (1990), Loeke (1992), and Hughes (1986) recognized benefits to having students verbalize their thinking skills and processes to others. "Frequent opportunities to verbalize thinking help students become more aware of reasoning" (Hughes, 1986, p. 36). During the project there were a few occasions when we had class discussions where students shared their metacognitive experiences. Although these were limited because of time constraints, I felt that these sessions were beneficial and with more frequent discussions like these throughout the school year, students would readily develop a metacognitive vocabulary and comfortably share their experiences. Problems might be shared and solutions proposed at the time of discussion. When students are metacognitively aware, then library research projects and other undertakings will be more manageable for students.

I contend that demonstrating the use of metacognitive strategies for students and teaching them to monitor their mental processes is valuable. It encourages thinkers to use strategies that will allow them to be successful in tackling life's problems and challenges. Teaching metacognitive strategies offers students a repertoire of tools that are available to them at all times. The better equipped the

executive monitor, the more positive challenging experiences will be for that person and the more likely the possibility of success.

Metacognitive strategies must not be taught in isolation. Just as library skills need to be taught within curriculum, teachers must ensure that metacognitive aspects are taught within the context of curriculum and with other learning processes. Presented in a meaningful way, metacognition becomes an integral part of learning for students. Metacognition is a process and cannot be fostered by teacher transmission. Like other processes it needs to be cultivated, applied, and honed through experience as it is applied to other learning.

Educators need to be conscious of their expectations for students and the possibility of overloading tasks that they give to students. The task we expected the grade five students to complete in this research project was a tall order. The students had so many constraints to deal with while they wrote their science fiction stories, that it very likely affected the amount of factual information they included in their stories. Hindsight tells me that the grade fives should have had more experience with incorporating factual information into their writing before we attempted this project. However, nothing ventured, nothing gained. This experience compels me to caution other teachers about overloading tasks for their students.

Teaching metacognitive strategies and having students monitor their metacognitive processes may be a powerful way for teachers' to know when and how to intervene. Using thinking journals and teacher observations might help teachers to determine where students are having difficulty and then provide the necessary guidance. A student who is unable to plan may require the teacher's help in organizing himself or herself and in setting goals. If it is clear from the journal entry and teacher observation that a student is unable to follow plans, this may signal the teacher that intervention is required. Monitoring how their students use metacognition is valuable for teachers to ensure that students learn how to use their mental processes to maximize their learning.

Teacher-librarians need to be aware of metacognitive processes and monitor the metacognitive processes of their students so that library research tasks will be

manageable and successful for students. In this way teacher-librarians can provide guidance in the metacognitive processes of their students. Teaching metacognitive strategies to grade five students worked well for our library research. The students were able to consciously monitor their metacognitive processes and I believe this heightened and enriched the library research experience for most of the students. Therefore, including metacognitive strategies as part of research projects for children is an important consideration.

Conclusion

It is evident that encouraging students' metacognition is an important step in helping students to achieve success in an information and technology rich environment. This study shows the potential for maximizing success for students who monitor their own mental processes. Students' thoughts were revealed as they engaged in the library research process. Although some students were more aware of their own mental processes than others throughout the project, all of the students had the opportunity to monitor their process experiences and their own thinking. How cognizant students were of their own thinking seemed to affect their behavior towards achieving the goals and sub-goals that they had set for themselves. This study also demonstrated that these grade five students were able to use the metacognitive strategies that were built into the unit plan.

Valuable learning occurs through process. Focus on process needs to take priority over product more often. Content learning has too often become the focus for students' learning in school. Students' engagement in process and awareness of their engagement in process is essential to their learning. Process learning can be transferred to other learning situations. In this way the stage can be set for lifelong learners to perform successful feats required by life's problems and challenges.

Almost two decades ago Flavell (1979) stated that ideas about metacognition at that time could someday be transformed into a method of teaching to encourage wise and thoughtful decision making and better learning in schools. With advances in

technology and the wealth of information available, it has become more necessary for students to plan and regulate their own learning. Therefore, to foster this metacognitive empowerment among learners it is important for teachers and teacher-librarians to include metacognition as a part of their teaching. Monitoring and regulating one's self are essential processes. Awareness, planning, self-evaluation, and self-regulation are key metacognitive aspects to knowing one's self and to improving one's learning.

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Appendix A

Student Questionnaire (Research Projects)

Research Projects

The questions below are all about library research projects. Please read each question carefully, think about **your** answer to the question, and write your response on the lines below each question. Thank you for helping me with **my** research project!

1. Tell me about a research project you have completed.

2. How was this project different from others you have done before?

3. What materials or resources did you use? How did you use them?

4. What worked well? Give some examples that you can think of.

5. Did you have any problems? Tell me about them.

6. **Think about writing a report.** How did you get started? How did you feel at this point?

7. What did you do in the middle of your report? How did you feel at this point?

8. How did you finish up? How did you feel then?

9. What were some of the things you learned?

10. How might what you learned help outside of school?

11. What did you like best about this research project? Why?

12. Was there anything you didn't like? If so, why?

13. Tell me about research you or other people do outside of school.

Appendix B

Sample Letter and Consent Form

February 19, 1996

Dear Parents/Guardians:

My name is Andrea Roche and I am a teacher-librarian who is attending the University of Alberta, working on my Master's in Education in the area of school libraries. I am particularly interested in how students think about their own mental processes during library research assignments. In order that I may fulfill my thesis requirements, I would like to conduct a study with students who are engaged in a library research project. This is an invitation for your child to become part of my study relating to the school library research process. Participation in this study may increase students' self-awareness of their thought processes during the research process and may increase their confidence and success when doing future research assignments.

Participation in this study will involve a few different activities. I will be asking students to complete a simple questionnaire to help me to find out about what they already know about doing research. I will also be teaching a unit on space with your child's teacher, Mrs. Smith. I will be observing students while they are carrying out the research assignment and making notes of my observations. In order that I may find out how students are thinking I will be audio-taping a few students as they discuss their research with other students. I will be asking students to keep a journal of their thoughts and experiences during the project. At the end of the project I will select a number of students and interview them about their research experiences. These interviews will also be recorded on audio tape. Students' work samples may also be used for illustrative purposes.

The data collected and analyzed during this study will be shared in my thesis. Anonymity will be preserved since the names of students, teachers, or schools will not be used in any reporting of the research. Students are free to withdraw from the research at any time without penalty. If on the day of the questionnaire or an interview your child is shy or unwilling, he/she will not be made to participate. I will be the only person who will study the questionnaires, journals, or audio-taped conversations.

Please complete the attached consent form indicating whether or not you wish your child to participate in this study, and return it to your child's teacher. If you have any questions or concerns regarding this study, please feel free to contact me at 462-4709. Thank you for your consideration.

Sincerely,

Andrea Roche
Graduate Student
Department of Elementary Education
University of Alberta

Consent Form

Name of Parent/Guardian _____

Address _____

Telephone _____

I DO GIVE permission for _____ to participate in Andrea Roche's
research on children's experience of the research process.

parent's signature_____
date_____
participant's signature**OR**

I DO NOT GIVE permission for _____ to participate in Andrea
Roche's research to explore children's experience of the research process.

parent's signature_____
date_____
participant's signature

Appendix C

Criteria for Personal Journal (Diary) and Thinking Journal

Personal Journal (Diary)

- A person writes about personal activities or events. (e.g. family, friends, birthday celebrations, special events at home or at school)
- A person writes about their feelings.
- A person writes about their likes and dislikes.
- A person writes about future plans.
- * A personal journal gives an honest account.

Thinking Journal

- A person writes about their goals, plans, predictions, and expectations.
- A thinking journal may include results of an investigation.
- A thinking journal may be a written record of what was done.
- It may include an evaluation of how things are progressing. (Are things going well? Are there problems? What changes do I need to make?)
- A thinking journal may include questions that you may ask yourself:
Why did I make that decision or choice?
What do I think might happen?
What do I need to do?
- A thinking journal may give reasons why you did something.
- A thinking journal may give reasons why you did not do something.
- A thinking journal may tell how you intend to change something.
- * A thinking journal gives an honest account.

Appendix D

Sentence Structures for Metacognitive Aspects

Sentence Structures for Metacognitive Aspects**Planning (Prediction and Goal Setting)**

Today I am going to _____.

The steps I will take are _____.

In order to _____ I need to _____.

Today I plan to _____.

If I _____ I will probably _____.

The materials I need are _____.

I will take _____ minutes to _____.

Awareness

I know I need to _____.

I see that _____.

I realize _____.

I had problems with _____.

I was successful at _____.

I achieved the following goals: _____.

Self-Reflection and Evaluation

Today I was successful at _____ because _____.

Today I was not successful at _____ because _____.

_____ worked really well for me.

_____ did not work well for me.

I think the reason for _____ is because _____.

Self-Regulation (Action)

I will _____ because _____.

Next time I will _____.

I need to _____ so that _____.

Instead of _____ I am going to _____.

Appendix E

Story Map Outline

Story Map Outline

Characters <i>(Who ?)</i> 	Setting <i>(Where and when does the story take place?)</i> 	\ TITLE / \ Events /
Main Conflict/Problem <i>(What is the problem?)</i> 	Resolution/Solution <i>(How is the problem solved?)</i> 	

Appendix F

Thinking Journal Handout for Students

**Thinking Journal:
Ideas, Thinking and Learning for Research Project**

- A thinking journal may be kept by a scientist or a researcher.
- A thinking journal includes the thinking and the learning that you are doing, connected with a project.
- A person writes about their goals, plans, predictions, and expectations.
- A thinking journal may include results of an investigation.
- A thinking journal may be a written record of what was done, what needs to be done, what could be done, and what will be done.
- It may include an evaluation of how things are progressing. (Are things going well? Are there problems? What changes do I need to make?)
- A thinking journal may include questions that you may ask yourself:

Why did I make that decision or choice?

What do I think might happen?

What do I need to do?

- A thinking journal may give reasons why you did something, why you didn't do something, or why you should do something.
- A thinking journal may tell how you intend to change something.
- * A thinking journal gives an honest account.

Appendix G

Mrs. Roche's Plans (March 4, 1996)

Mrs. Roche's Plans (March 4, 1996)

When I go to the library today I will observe the grade five students as they are retrieving their information for their science fiction stories. As I observe the students, I will record my observations in my notebook. I know it will be difficult for me to record everything that goes on because it is a large class and I will also be helping students. I will probably have to use some shorthand techniques for myself so that I can write very quickly.

I will check to see whether or not students are at the centers where they planned to be and if they are following the plans they wrote in their thinking journals. I will also ask students any questions that I have that I think need to be answered. I will spend about 30 minutes doing all of these things.

I know all of these things will be difficult for me to do all at once. I think I may run short of time to do everything I want to do because whenever I interact with students the time goes very quickly.

When we are finished with our information retrieval session, I plan to discuss with the class how things went for them. What difficulties did they encounter? Did they stick to their plans? What successes did they have? I know other questions will come to me. I am so anxious to hear what the grade fives have to tell me!

Appendix H

Terry's Science Fiction Story

In the year ~~1990~~ 1900

IT WAS A STORMY EVENING IN THE YEAR 1900 IN THE CITY OF EDMONTON, WHEN I WAS PEACEFULLY SLEEPING IN MY BED THINKING ABOUT WHAT HAPPENED TO ME TWO WEEKS AGO. TWO WEEKS AGO I HAD FOUND OUT THAT I WAS GOING TO SPACE. WE WOULD GO IN APPROXIMATELY I WAS SO EXCITED. TWO WEEK'S LATER... WE MET UP WITH OUR CREW. IT WAS ME MY BEST FRIEND ALYSS AND A GIRL NOR ME OR ALSS KNEW. HER NAME WAS ERINNE. IN THE TIME THAT WAS REMAINING BEFORE LAUNCH WE GOT TO KNOW ERINNE. ALYSS, ERINNE AND I ALL BECAME GREAT FRIENDS. LAUNCH MORNING...

"HURRY ERINNE", ^{those}~~those~~ WERE THE WORDS SPOKEN BY ME AND ALYSS ON LAUNCH MORNING PATIENTLY WAITING FOR HER. WHEN WE WERE GETTING OUR AIR SUPPLY TUBES HOOKED UP TO OUR SPACESUIT, I ASKED, "HOW LONG WILL THIS AIR LAST".

"SIX TO EIGHT HOURS" ~~XXXXXXXXXXXXXXXXXXXX~~

WHEN WE WERE IN THE SPACESHIP AND READY TO LAUNCH...

10,9,8,7,6,5,4,3,2,1, BLAST OFF!!!!!! WE GOT SHOT INTO THE AIR LIKE A BULLET FROM A GUN. WHEN WE WERE SAFELY IN SPACE WE TOOK OFF OUR SPACESUIT, AND STARTED FLOATING WITH NO GRAVITY ALL OVER THE SPACESHIP. WHEN ALL OF THE SUDDEN I HEARD A NOISE COME FROM THE BACK OF THE SPACESHIP. I CALLED JOHN THE CAPTAIN OF THE CONTROL ROOM AND HE TOLD ME TO CHECK THE COMMAND MODULE. WE HAD A PROBLEM ONE OF THE MOTORS IN THE COMMAND MODULE EXPLODED. WE GOT OUT OUR SPACE TOOLS AND THE FIX IT YOURSELF MANUAL. IN NO TIME WITH HELP FROM THE PEOPLE BACK HOME WE FIXED IT IN A HALF AN HOUR. WE WENT THROUGH TONS OF GALAXIES AND PASSED DIFFERENT PLANETS WITH MORE

THAN ONE MOON.THE PLAET THAT CAUGHT MY EYE THE MOST WAS SATURN.



IT HAD SEVEN THIN RINGS CIRCLING IT,IT WAS FILLED WITH BRIGHT COLORS.I ASKED MY CREW IF WE COULD LAND ON IT,THEY ALL AGREED. WHEN WE GOT INTO THE LUNAR MODULE THAT IS USED TO GET TO AND FROM THE MOON'S SURFACE IN OTHER WORD'S SATURN.I WAS THE FIRST TO STEP ON SATURN.WE COLLECTED LITTLE ROCKS IN THE ATMOSPHERE OF THAT PLANET.WHEN WE WERE DONE WE CLIMBED BACK INTO THE LUNAR MODULE AND THAN THE SPACESHIP.IT WAS A GREAT COUPLE OF WEEK'S THAT WE SPENT IN SPACE,AND I'LL NEVER FORGET IT.WHEN WE SAW OUR LANDING SITE WE WENT DOWN TO IT.WHEN WE GOT OFF THE SHIP WE THEN GOT GREETED POLITELY BY JOHN AND SOME OTHER WORKER'S.WE TOLD THEM ALL ABOUT OUR TRIP.FROM THAT DAY ON THE WORD SPREAD THAT WE WENT TO SPACE AND WE THEN BACAME A LEGEND.